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TENTH BIENNIAL REPORT

OF THE

STATE BOARD OF HEALTH

OF

CALIFORNIA.

SERIAL

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June 30, 1886–
June 30, 1888

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TENTH BIENNIAL REPORT

OF THE

STATE BOARD OF HEALTH

OF

CALIFORNIA.

For the Fiscal Years from June 30, 1886, to June 30, 1888.

CALIFORNIA STATE BOARD OF HEALTH.
SPECTEMUR AGENDO
ORGANIZED APRIL 22 1870.

SACRAMENTO:
STATE OFFICE : : : : J. D. YOUNG, SUPT. STATE PRINTING.
1888.

MEMBERS OF THE CALIFORNIA STATE BOARD OF HEALTH.

President.	
HENRY S. ORME, M.D.	Los Angeles.
Secretary.	
GERRARD G. TYRRELL, M.D.	Sacramento.
W. R. CLUNESS, M.D.	Sacramento.
R. BEVERLY COLE, M.D.	San Francisco.
JAMES SIMPSON, M.D.	San Francisco.
J. M. BRICELAND, M.D.	Shasta.
C. A. RUGGLES	Stockton.

STANDING COMMITTEES OF THE STATE BOARD OF HEALTH.

1. *On the Salubrity of Public Institutions, Schools, Hospitals, Prisons, Factories, etc.*

DOCTORS COLE, ORME, AND SIMPSON.

2. *On Statistics relating to Life and Health, Modes of Employment and of Living, and the Comparative Healthfulness of different localities.*

DOCTORS CLUNESS, BRICELAND, AND TYRRELL.

3. *On Intoxicating Liquors, Inebriate Asylums, Pathological Influence of Alcohol, etc.*

DOCTORS SIMPSON, COLE, AND RUGGLES.

4. *On Influence of Irrigation, Tree Planting, etc.*

DOCTORS RUGGLES, ORME, AND CLUNESS.

On Legislative Business.

DOCTORS BRICELAND, ORME, AND TYRRELL.

On these Committees the Secretary of the Board is ex officio a member.

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REPORT OF THE BOARD.

To his Excellency R. W. Waterman, *Governor of California:*

In presenting the tenth biennial report of the State Board of Health to your Excellency, the Board can, with much pleasure, refer to the fact of the increased popularity of the Board, and to the general desire of the public to aid its work in its watchful care of the public health, and its endeavor to prevent epidemic disease from entering this State.

It is also with gratification the Board can announce to your Excellency that through the forethought of the Legislature it was placed in a position to take such measures of prevention, that when the State was threatened with an epidemic of smallpox, it was enabled by the appointment of proper sanitary officers to prevent in a great measure its spread and limit its duration.

It has, however, become more than ever evident to the Board that, in order to confer upon the State that benefit for which the State Board of Health was organized, a change must be made in our health laws. At present they are inefficient, and lack that precision and mandatory power that are necessary to the proper maintenance of sanitary regulations. The laws relating to births, marriages, and deaths are not observed, and in order that we may obtain reliable statistics of the death rate throughout the State, it is absolutely necessary that a record of each death be made wherever it occurs. The necessity of this is obvious, for by it only can we determine the healthfulness of the different sections of the State; the relation that exists between climate and longevity; the effect of modes of life and living; the relative effect of drainage upon health, etc.; and above all, the power of determining positively and legally the question of death, where the right of succession to property is involved in the ascertainment of such fact. Another no less important result effected by a correct return of deaths is the prevention of crime, or its probable detection.

The safety of the people being the especial province of our Board, we consider the general vaccination of the public one of the most important aids for that purpose; and as a step in that direction we recommend that no child be admitted into the public schools without first showing satisfactory evidence that vaccination has been successfully performed.

We also recommend that a law be established making it compulsory upon all persons cognizant of the fact, to make known to the proper officer the existence of contagious or infectious disease, whenever such occurs in their person, family, or habitation.

We also recommend that it be made compulsory to establish local Boards of Health throughout the State. These should be required to act in cooperation with the State Board, keeping it advised of the appearance of epidemic or contagious disease, and the causes by which they are apparently promoted, that thus through them unification of purpose may be complete with the State Board, and preventive measures immediately instituted for the suppression of disease.

We desire to call your Excellency's attention to the subject of the mineral springs of this State. For many years this Board has endeavored to excite an interest in the great sanitary resources which lie undeveloped in these springs, and four years since, the Legislature, upon the recommendation of the Board, created the office of State Analyst, and passed a law making it his duty to analyze and give to the public the chemical constituents of these springs. Owing to the great number and varying properties of these mineral waters, the State Analyst found he had not assistance enough to do the work, and our springs, that should be a source of great revenue to our State, are still comparatively unknown. We would therefore recommend that a sufficient sum be set apart for the State Analyst to employ competent assistants in this great work, so that the medicinal value of our springs (which cannot be surpassed, or perhaps equaled, by any of the thermal springs of Europe) may be determined, and we may thus be enabled to offer to invalids additional inducements to visit our State to recuperate their health.

The subject of quarantine having engaged the attention of the Board for some years past, it is with great satisfaction that our Board can announce to your Excellency that through its persistent efforts it has been enabled to have a law pass Congress establishing quarantine stations at San Francisco and San Diego, which, we trust, will be so organized as to afford the utmost protection to the State from the invasion by sea of any infectious or contagious disease. We must not, however, neglect the danger which threatens us by land. Upon our southern border we are constantly menaced by smallpox, cholera, and yellow fever; the latter of which, being epidemic in many parts of Mexico, is a constant source of anxiety.

We therefore ask your Excellency to impress upon the Legislature the urgent necessity that exists for the continuation of the contagious disease fund, which did such excellent service for us within the past two years, not only in limiting the spread of disease upon this coast, but in enabling our Board to be represented at the National Conference of State Boards of Health, whereby coöperation with sister States for mutual protection was obtained.

We would also call your Excellency's attention to the fact that leprosy is being gradually introduced into this State, principally through Chinese immigration, and would recommend that all such cases found within this State be strictly segregated, and a law passed forbidding the landing or introduction of such persons, upon any pretense whatever, and their immediate return to the place from whence they came, if so imported.

We hereby append the reports requested by your Excellency as to the sanitary condition and administration of the various institutions receiving State aid.

In our Permanent Secretary's report will be found a detailed account of the diseases which have prevailed throughout the State, their mortality, and the means used for their suppression, together with the necessary expenditure of the Board.

We regret to say that the yearly appropriation given to the State Board of Health is not sufficient to enable it to do such work as properly comes within its province, and the Board is unanimously of the opinion that an increase of the appropriation would be a manifest benefit to the State.

We would also recommend to your Excellency that the law organizing the State Board of Health be so amended as to provide a per diem of ten dollars for each member while engaged in the actual duties of the Board, as a slight compensation for the loss of time necessarily given in the service of the State.

H. S. ORME, M.D., President.
G. G. TYRRELL, M.D., Secretary.
W. R. CLUNESS, M.D.
JAMES SIMPSON, M.D.
R. B. COLE, M.D.
CHAS. A. RUGGLES, M.D.
J. M. BRICELAND, M.D.

ABSTRACT OF PROCEEDINGS

OF THE

QUARTERLY MEETINGS HELD DURING THE THIRTY-EIGHTH AND THIRTY-NINTH FISCAL YEARS, ENDING JUNE 30, 1888.

The Regular Quarterly Meeting of the California State Board of Health,

Was held in Sacramento July 3, 1886, at the usual hour.

Present—Dr. H. S. Orme, President; Dr. G. G. Tyrrell, Secretary; Dr. W. R. Cluness, Dr. J. M. Briceland, members; and by invitation, Professor W. B. Rising, State Analyst, and Hon. T. L. Thompson, Secretary of State. The absent members were Dr. R. Beverly Cole, Dr. Jas. Simpson, and Dr. H. C. Crowder, who each sent notes explanatory of their absence.

The minutes of the last meeting having been read and approved, the Secretary read the following letter from United States Senator George Hearst, in reply to a communication sent him regarding the passage of the quarantine bill:

Washington, D. C., May 9, 1886.

G. G. Tyrrell, *Esq., Secretary State Board of Health, Sacramento, California:*

Dear Sir: Your favor of April twenty-seventh, in relation to the "Act to estalish a Quarantine Station at the port of San Francisco," has been received, and the matter shall have my immediate attention and favorable consideration.

Thanking you for your kindness in specially directing my attention to this important matter, I remain,

Very truly yours,

GEORGE HEARST.

Which was received and ordered on file.

A communication from his Excellency, the Governor of Colorado, regarding the establishing of quarantine against the introduction of diseased cattle, was read and ordered placed on file.

The Secretary reported a visit to Truckee at the request of the citizens, which was approved, and a report thereof was ordered detailed in his biennial report.

The Secretary read his financial report for fiscal years thirty-six and thirty-seven, which was approved and ordered placed on file.

On motion of Dr. Cluness, the Secretary was instructed that having first obtained the consent of Dr. I. A. Watson, Secretary of the American Public Health Association, he was authorized by this Board to have reprinted in the ninth biennial report about to be published, Dr. G. Sternberg's prize essay on "Disinfection and Individual Prophylaxis against Infectious Disease," which was carried unanimously.

Professor W. B. Rising, State Analyst, made a verbal report upon the condition of the laboratory and the facilities possessed for the work designed to be accomplished by his office, but owing to a lack of assistants he was unable, without further aid, to carry out the provisions of the bill creating his office. He explained how the Secretary of the Viticultural Commission had analyses made. That Commission, having a fund at its disposal, could pay for help, and the Analyst could hire assistants. If the State Board of Health had a like fund, there would be no difficulty in obtaining analyses of foods, drugs, etc., and the mineral springs of the State; the analyses of the latter require careful manipulation, which, under Professor Bunsen, of Vienna, he had successfully studied, and was of the opinion that with assistance an exhaustive analysis of the medicinal waters of the State could be made at the rate of one each month, which would inure to the great benefit of the State. He thought that with an appropriation of $2,500 a year all the analytical work necessary could be done.

After the explanation of Professor Rising as to the necessity of funds to carry on his office in accordance with the intent of the law and for the benefit of the State; it was moved by Dr. Cluness—

> That it is the sense of this Board that an appropriation of $2,500 a year is required for the purpose of carrying out the object of the bill creating a State Analyst, and that the Governor be respectfully requested to ask for such appropriation in his next biennial message.

Carried.

Dr. J. M. Briceland moved that the thanks of the Board be returned to Professor Rising for his remarks, and that the Board pay his traveling expenses to this meeting, which was carried.

On motion, the Secretary was instructed to notify the absent members that they will be required to have their reports upon the subjects assigned them ready for the Secretary not later than the fifteenth day of August, as the biennial report must be in the hands of the State Printer by the first of September.

The Secretary announced to the members present the titles of the papers he had already received, as well as those promised for the biennial report, and it was agreed that not less than fifteen hundred copies be ordered printed by the State Printer for distribution.

There being no further business, after some desultory conversation upon sanitary matters, the meeting adjourned.

GERRARD G. TYRRELL,
Permanent Secretary.

The Regular Quarterly Meeting of the State Board of Health,

Was held in Sacramento October 16, 1886, at the usual hour.

Present—Dr. H. S. Orme, President; Dr. G. G. Tyrrell, Secretary; Dr. James Simpson, Dr. H. C. Crowder, Dr. J. M. Briceland, Dr. W. R. Cluness. Dr. R. B. Cole was not present, being absent from the State. Governor Stoneman and Hon. E. W. Maslin were present by invitation.

The minutes of the last meeting having been read and approved, the Secretary read a letter from Dr. Alemby Jump, of Downieville, relative to the appearance of typhoid fever in Forest City, and asking instructions in connection therewith. The Secretary informed the Board that he had replied to Dr. Jump's letter, advising him as to the course to be pursued. The Secretary also read the reply of Dr. Jump, detailing the result of his visit to Forest City, and his efforts to establish a sanitary reform there.

On motion, Dr. Jump's communications were placed on file, and the Secretary's action fully approved.

Dr. Cluness, in connection with the subject of typhoid fever, detailed a statement made in a late medical journal relative to the production of typhoid fever by dead animal matter decaying in wells, and considered the subject worthy of continued investigation. The cases to which he referred were those in which a number of dead and decaying frogs, toads, etc., were found in a well which was undergoing a process of cleansing, and to the water from which the disease was attributed.

Dr. James Simpson considered that the genuine cases of typhoid fever, with the characteristic ulceration of Peyer's glands, are more rarely met with than formerly, and believed that a great many of the continued fevers that we now treat lack the essential characteristics of typhoid fever. He related some cases in confirmation of this view, and was inclined to believe in there being a typho-malarial fever, or, at least, a typhoid condition accompanying malaria.

Dr. J. M. Briceland remarked that in his town (Shasta) the source of all the supply of water to the inhabitants was derived from wells, and, to his knowledge, the remains of dead animals, such as snakes, toads, etc., have frequently been found in them, as a cause of the unpleasant flavor of the water, but he never found as a result of the drinking of this water any injurious consequences to speak of; he was doubtful of the theory that water so polluted could originate typhoid fever in the absence of the specific germ.

The Secretary read a communication from a Mrs. Furmey, of Fresno, asking the assistance of the State Board of Health to remove a nuisance. The Secretary informed the Board that he had written to the lady, detailing the proper course to be pursued by her in the premises.

On motion, the letter was placed on file, and the action of the Secretary approved.

The Secretary presented a communication from the proprietor of the "Sanitary Engineer," asking for a renewal of the Board's subscription.

On motion of Dr. Cluness, the subscription to the "Sanitary Engineer" was ordered discontinued, except one copy for the use of the Board.

On motion of Dr. Simpson, the Secretary was authorized to subscribe for one copy of the "Sanitary News," one copy of "Sanitary Engineer," one copy of "Sanitariam," and any other sanitary publication that might add to the efficiency of this Board, which was carried unanimously.

The Secretary desired to call the attention of the Board to an editorial which appeared in the "San Francisco Evening Bulletin" of October 1, 1886, entitled "Precaution Better than Cure," as follows:

> An epidemic of smallpox prevails in southwestern Sonora. Its greatest ravages are at Guaymas, Hermosillo, and intermediate points on the line of the railroad. Those places are in daily communication with San Francisco—via the Sonora and Southern Pacific Railroads—but no steps have been taken to establish a quarantine at the State boundary line. It would be an easy matter to guard the single line of communication across the Colorado at Yuma.
>
> It is known by experience that smallpox gives the authorities a good deal of trouble when it gets into this State; and the best plan is to fight it at a distance.
>
> Will the State Board of Health take notice, and act accordingly?
>
> All passengers should be quarantined at the border for a time covering the incubation of the fell disease.

And, also, the following reply, which was approved of by the Board, and, on motion, ordered spread upon the minutes:

> Editor Evening Bulletin: In an editorial article in your valuable paper, on Friday evening last, entitled "Prevention Better Than Cure," you very truthfully remarked that smallpox, in an epidemic form, prevailed in southwestern Sonora, and complain that no steps have been taken to establish a quarantine at the boundary line. Further on you ask the suggestive question, "Will the State Board of Health take notice, and act accordingly?" In reply, allow me, as Executive officer of the Board, to say that at the session of the Legislature, January, 1885, Governor Stoneman, in his message, advised, and subsequently the State Board of Health, in anticipation of just such a contingency as has now arisen, *demanded* that a Contingent Fund be provided for the purpose of protecting this State by

quarantine against the approach of infectious diseases, if such danger should threaten us. It was asked that this fund be placed at the disposal of the Governor, to be used only at his discretion, and by the advice and at the request of the State Board of Health. I regret to say that the advice of the Governor to the Legislature was totally ignored, and the demand of the State Board of Health denied most positively.

At a subsequent meeting of the State Board of Health, alarming reports having been received from Sonora, the Governor was asked if there was any fund at his disposal that could be used for quarantine purposes. He replied that there was not, and that there were no means of obtaining a fund, except by a proclamation calling upon each county to levy a special tax for that purpose, and then such tax would be under the control of the county levying it, and would not be available by the State Board of Health, except by and with the consent of such county. Under these circumstances the State Board of Health can only watch with dismay the approach of preventable disease, being utterly powerless, from want of funds, to place barriers to its progress in the persons of an efficient corps of quarantine officers along our southern border. The State is now almost wholly defenseless against the approach of cholera, yellow fever, or smallpox, whenever they choose to cross our frontier, for which disastrous condition of affairs we have to thank either the disgraceful parsimony, criminal negligence, or, more probably, the unmitigated stupidity of the Legislature of 1885.

Yours respectfully,

G. G. TYRRELL, M.D.,
Permanent Secretary State Board of Health.

SACRAMENTO, October 3, 1886.

The Secretary then read report of Consul Willard, at Guaymas, reporting twenty-six deaths from smallpox, and a total death rate of forty-three for the month of September, 1886.

On motion the report was ordered on file, and the inability of the Board, for the want of funds, to order an immediate quarantine deplored.

The Secretary presented the ninth biennial report of the State Board of Health of California, just published, of which an edition of two thousand was ordered printed, which, having been considered by the Board, was approved, and the Secretary commended for his assiduity in getting out so promptly so valuable a report, which was ordered to be distributed.

Dr. Orme reported as our delegate to the National Conference of State Boards of Health and the American Public Health Association, held at Toronto, Canada, October 4 to October 9, 1886, that while en route he called upon Surgeon-General J. B. Hamilton, of the Hospital Marine Service at Washington, D. C., who assured him that he was much pleased to meet a representative of the State Board of Health of California, and that he would always be ready and willing in the future, as he had been in the past, to coöperate with our Board, and to use his official influence and power to assist us whenever we needed his aid in preventing and "stamping out" all epidemic disease which might threaten the invasion of our State, either by ocean travel or by way of our southern border.

The National Conference, as also the American Public Health Association, were largely attended by representatives of the different State Boards of Health, as also other health organizations of the United States and Provinces of Canada, with many of whose names we are all familiar as being the leading sanitarians and health officers of the country. The papers read and the discussions thereon were of a most interesting character, and of great practical importance to any one engaged in the good work of State preventive medicine.

A few of the many important subject-matters reported and discussed might be mentioned, being those which have from time to time engaged the thoughtful care and attention of our own Board. The first subject before the Conference was, "A comparative view of sanitary laws, and what changes are needed in those of Maine," which, after an animated discussion, was referred to a special committee to codify the laws of the different States and present them at the next meeting of the Conference.

The second subject was the "Transportation of dead bodies, especially those dying from contagious or infectious diseases," which elicited a lengthened discussion and great diversity of opinion. It appeared, however, to be the sense of the majority of those present that the transportation of any or every dead human body, the subject of infectious disease, over the different great lines of travel, ought to be discouraged by the members of the medical profession. As to the length of time a body ought to be required to remain buried, of those dying of cholera, yellow fever, smallpox, etc., it was thought best, after a long and thorough discussion of the whole subject, not to fix the limit of number of years. Circumstances as to climate, seasons, heat and cold, etc., would necessarily have to govern in the majority of cases, and therefore that this should be left to the local health authorities of the different States to regulate.

The third subject, "How, in the investigation of the causes of disease, can State Boards of Health secure the best results?" After considerable discussion a committee of five was appointed to devise a plan for obtaining facts from the physicians in the different States through their respective State Boards of Health, and that the committee report at the next annual meeting a plan to that end, should it consider the same to be advisable.

Many other subjects of vital importance to State Boards of Health and sanitarians were reported upon and discussed, both at the Conference and at the meeting of the American Public Health Association, viz.: "Should vaccination be made compulsory;" "Local Boards of Health;" "On blank forms for a uniform system of vital statistics, etc."

A resolution was adopted at the Conference urging the importance and necessity of disinfecting and destroying the sputa of all persons suffering from pulmonary consumption, so as to protect those in attendance on or exposed to the disease. But the most important subject-matter, which could at the time interest our State Board of Health, was in relation to interstate notification in regard to infectious diseases and interstate coöperation in regard to inspections and other work for the prevention of the same. After a very full and free discussion of the whole subject the following resolutions were adopted by the National Conference, and the American Public Health Association was requested to indorse them:

WHEREAS, It is necessary for the protection and preservation of the public health that prompt information should be given of the existence of cholera, yellow fever, and smallpox; be it,

1. *Resolved*, That it is the sense of the National Conference of State Boards of Health, that it is the duty of each State, Provincial, and Local Board of Health in any locality in which said diseases may at any time occur, to furnish immediately information of the existence of such disease to Boards of Health of neighboring and provincial States, and to the local Board in such States as have no State Board.

2. *Resolved*, That upon rumor or report of the existence of pestilential disease, and positive definite information thereon not being obtainable from the proper health authorities, this Conference recommends that the health officials of one State shall be privileged and justified to go into another State for the purpose of investigating and establishing the truth or falsity of such reports.

3. *Resolved*, That whenever practicable, the investigations made under the preceding section shall be done with the coöperation of the State or local health authorities.

4. *Resolved*, That any case which presents symptoms seriously suspicious of one of the aforenamed diseases, shall be treated as suspicious, and reported as provided for in cases announced as actual.

5. *Resolved*, That any case respecting which reputable and experienced physicians disagree as to whether the disease is or is not pestilential, shall be reported as suspicious.

6. *Resolved*, That any case respecting which efforts are made to conceal its existence, full history, and true nature, shall be deemed suspicious, and so acted upon.

7. *Resolved*, That in accordance with the provisions of the foregoing resolutions, the Boards of Health of the United States and Canada represented at this Conference do pledge themselves to an interchange of information, as herein provided.

The resolutions in their entirety were adopted.

It was moved that the action of the Board of Health of the State of

Louisiana in dealing with the outbreak of yellow fever at Billoxie, in August last, be commended by this Conference of State Boards of Health, which was carried.

The National Conference refused to become a section of the State Boards of Health of the American Public Health Association, and moved that a committee be appointed to draft a constitution and by-laws with a view of placing the Conference on a permanent basis, and report at next meeting of the Conference.

This motion was unanimously adopted.

On motion, it was resolved to levy the sum of $5 on each State and Province represented at the Conference, to meet incidental expenses.

Dr. J. N. McCormick was reëlected President, and Dr. G. P. Conn, Secretary for the ensuing year.

The Conference adjourned to meet at Washington, D. C., at the same time of the meeting of the International Medical Congress.

The American Public Health Association, after transacting a great deal of business, including some important work bearing upon sanitation and State preventive medicine, and hearing the reports from the committees on State Boards of Health, and the report from the several representatives of the several State Boards of Health (California among the number, as regards her sanitary laws, etc.), adjourned to meet in Memphis, Tennessee, December, 1887, Dr. G. M. Sternberg being elected President, and Dr. Irving A. Watson reëlected Secretary.

Dr. Cluness moved that whatever expenses Dr. Orme had incurred in behalf of the California State Board of Health be refunded him, and that his expenses as delegate to the American Public Health Association and the Conference of State Boards of Health be paid, which was unanimously carried.

Hon. E. W. Maslin stated, in reply to a question, that he had prepared some bills, and was preparing others, for presentation to the Legislature, embodying the recommendations presented to the Governor by this Board, and hoped that they would be so drawn as to comprise the legislation required for the efficiency of the Board.

Dr. Briceland, who was a candidate for the Legislature from Shasta, promised that, if elected, he would give these bills his utmost attention, and, if possible, carry them safely through the Senate, as he fully believed that such legislation would add to the safety of the people and the good of the community.

There being no further business, the meeting adjourned.

G. G. TYRRELL,
Permanent Secretary.

THE REGULAR QUARTERLY MEETING OF THE STATE BOARD OF HEALTH,

Was held in Sacramento January 12, 1887, at the usual hour.

Present—Dr. H. S. Orme, President; Dr. G. G. Tyrrell, Secretary; Doctors Cluness and Briceland, members; and by invitation, Dr. Matthews of Tehama, Dr. Young of Stockton, Dr. Foulkes of Oakland, Professor Rising of Berkeley, and Hon. E. W. Maslin, legal adviser of the Board. Letters of apology were read from Dr. H. C. Crowder, Dr. Jas. Simpson, and Dr. R. B. Cole, explaining their absence from the meeting.

The minutes of the last meeting having been read and approved, Dr. Cluness, commenting upon the subject of the interment of dead bodies, inquired of the President, Dr. Orme, if the American Public Health Association had decided upon any general rule to be observed about the period when bodies might be safely disinterred for transportation. He said that upon endeavoring to get a deceased body removed from Mazatlan, he discovered that no body could be disinterred and removed under five years' burial.

Dr. Orme replied that no fixed date had been recommended by the association, as such measures would be influenced by the climate, soil, etc., of each place, and therefore the regulations governing the disinterment would have to be governed by the place of interment, and adapted thereto.

The Secretary then read the report of Consul Willard, at Guaymas, who reported smallpox as still there, but confined chiefly to the lower classes and Indians.

The prevalence of glanders in several parts of the State was discussed, during which Dr. Matthews, of Tehama, related an instance of death from this disease in Butte County, in the person of a man who had become inoculated with the disease and speedily succumbed. He was of the opinion that legislative power ought to be sought to enable us to exterminate this dreadful disease from California.

After a very general discussion of the subject, it was the unanimous opinion of the Board that legislation should be had upon this matter immediately, to prevent the needless sacrifice of human life, which is sure to take place if the disease is permitted to spread.

The Secretary desired to call the attention of the members of the Legislature then present, Drs. Briceland, Matthews, and Young, to some matters pertaining to the State Board of Health, upon which legislation is desired in order to increase the efficiency of the Board and to add to the welfare of the State. He said that perhaps it was known to those gentlemen that smallpox was now upon the borders of this State, and at any time it may cross the line and invade California. Yellow fever was endemic in Mazatlan, Rosario, Guaymas, and at any moment may become epidemic, and be precipitated upon us. Cholera is still in Japan; is epidemic in South America, and will, doubtless, travel to Panama, from thence it will reach Mexico and probably California. To arrest any of these diseases by quarantine, there is not one dollar that can be used by the Governor for that purpose, therefore, the State Board of Health desires that a contingent fund be appropriated for that purpose. The sum should not be less than $20,000, to be used at the discretion of the Governor and only by the advice and at the request of the State Board of Health. Should we happily escape from the threatened dangers, the fund would not be drawn upon. The Board, however, earnestly hoped such sum would be placed at the disposal of the Governor, if needed.

Drs. Matthews and Young, members of the Assembly, promised such measure their earnest support, and it was unanimously agreed that the Committee on Legislation be and is hereby instructed to ask the legislative Committee on Ways and Means to place such sum in the appropriation bill of this session of the Legislature.

The Secretary then explained that it was also sought to amend the health laws of California in relation to the burial of the dead. As now practiced, it requires no formality (except in cities having ordinances to that effect) to bury the dead, and as a consequence, crime is not unfrequently hidden in the grave. We now desire a law enacted that will not allow the burial, cremation, or other disposal of the dead human body, without first having obtained a permit, signed by a proper officer upon presentation to him of a certificate of death signed by the attending physician, and giving the name, age, nativity, sex, occupation, and cause of death; or, if deceased had no attending physician, then by the Coroner, or in his absence, by two reputable citizens, who shall certify to the best of their ability. It is hoped by this means to collect all the deaths in the State, to diminish crime, and obtain an authentic record which will legally establish the decease of any one whose death it is desirable to prove beyond doubt.

Again, the Board desires to amend the laws relating to births, marriages, and deaths, so that the vital statistics of this State might be rendered of some value in their compilation. It is proposed to pay a small fee for each birth, marriage, and death recorded, and to make it a penal offense to neglect this duty.

It is also proposed to amend the law relating to Boards of Health, and compel the establishment of such Boards in every county of the State, and if the organization of such Board or Boards is refused or neglected, then that the State Board shall have the power to organize such Boards, and render them a charge upon the county in the same manner as if organized by the county itself.

It is also proposed that a law be enacted compelling the vaccination of each and every child attending the public schools of this State, as is the law in New York and other progressive States.

It is also proposed to enact a law granting such mandatory power to the State Board of Health as will increase its efficiency and add to the welfare of the State.

Hon. E. W. Maslin then read the laws he proposed to present upon these subjects, and said the new Constitution stood in the way of obtaining any special legislation, as was the case before its adoption, but thought that such laws as were needed to insure the sanitary welfare of the State would be so general in their nature as to disarm all opposition to their passage.

The members of the Legislature and the Board having discussed the merits of each bill, it was resolved that the Committee on Legislation be requested to present the bills to the Legislature.

The members present promised them all the aid in their power to bestow, as they believed the bills to be drawn in the interest of the public, and for its benefit alone.

Professor W. B. Rising, State Analyst, stated that he had a deep interest in having the mineral waters of the State analyzed. He had received a large number of letters from parties abroad, asking information about the medicinal properties of the various mineral springs and a copy of their analysis, to which he was reluctantly obliged to reply that as yet no official analysis of them was made. In the matter of analyzing foods, drugs, etc., he thought he could illustrate it by what was being done in France, which he proceeded to do by explaining the different courses pursued, and in the most lucid manner gave an idea of what might be done in this State if the people were only educated up to its necessity. He detailed the case of a young man who was rendered dangerously ill by drinking grape juice adulterated with salicylic acid, which he declared was a common adulterant of unfermented wines on this coast. If an analysis of adulterated foods or drinks was reported by the State Analyst officially, stating the brand, etc., it would drive effectually such articles out of the market, and thus remove a constant factor in the production or intensification of disease.

Professor Rising also asked the approval of the Board to the following amendments to the law relating to the State Analyst, which he proposed having introduced this session of the Legislature, if indorsed by the Board:

SECTION 8. It shall be the duty of the State Analyst to maintain at the University, with the consent of the Board of Regents, a Museum of Chemistry. Here shall be collected and displayed a cabinet of chemical products, so arranged as to illustrate the various processes employed in chemical industries. This collection shall be supplemented by drawings, plans, etc., of existing chemical works, together with analyses of these various products; to the end that students of the University, and others interested in any branch of chemical industry, may have the opportunity of studying any or all the various processes used in chemical manufacture. He shall also collect samples of the various minerals, vegetables, waste products, of whatever kind, which are used elsewhere in chemical manufacture, or which may be so used, and examine, analyze, and investigate the same. He shall also collect such statistics and information relating to chemical problems as may be of interest or value to the State. He shall publish, from time to time, the results of his investigations pertaining to chemical industries in special bulletins, and in a biennial report to the Regents of the University of California.

SEC. 9. The State Analyst shall attend and participate, as he shall be able, in all meetings, conventions, and conferences of analysts in this country and in Europe, and permission is hereby granted him to absent himself from the State for that purpose; *provided*, he obtain the consent of the State Board of Health, the State Mining Bureau, the State Board of Viticultural Commissioners, and the Board of Regents of the University of California.

After some necessary explanations by Professor Rising of the nature of the proposed amendments and their practical utility, it was, on motion—

Resolved, That the amendments be approved and the bill referred to the Committee on Legislation for further action.

Which was carried.

It was discussed and approved that the Committee on Legislation ask for an appropriation of $5,000, for two years, to procure such clerical assistance to the State Analyst as will enable him to analyze the mineral waters of the State and make an official report thereon.

A communication was read from Buford & Co., Indianapolis, proposing to dispose of to this Board copies of the proceedings of the "Conference of States Boards of Health," held at Toronto, Canada, October, 1886, which is to be bound in the report of the State Board of Health of Indiana.

On motion of Dr. Cluness, it was resolved that the Secretary be authorized to confer with the Secretary of the Conference of State Boards of Health, by letter, and ascertain if the firm of Buford & Co. is authorized to issue such proceedings, and if so, to order at least fifty copies.

The Legislative Committee having been instructed to get their proposed measures before the Legislature at the earliest moment possible, and no further business being before the Board, on motion, the meeting adjourned.

GERRARD G. TYRRELL,
Permanent Secretary.

A SPECIAL MEETING OF THE STATE BOARD OF HEALTH,

Was held, at the request of the President, at the office of the Secretary, March 8, 1887.

A quorum being present, the object of the meeting, as explained by the Secretary, was for the purpose of taking into consideration the question of quarantining the southern border of the State, smallpox being reported as prevailing to an alarming extent in Los Angeles.

A telegram was received from Dr. R. B. Cole and Dr. James Simpson, stating that, in their opinion, a strict quarantine at this time against smallpox was useless, it having already invaded the State; in which opinion Dr. Meares, Health Officer of San Francisco, concurred.

The members present, having heard the reports from the President and

Secretary and a letter from Dr. Magee, of San Diego, were of the opinion that while strict quarantine might not now be applicable, yet an inspection of all trains coming from Texas, Mexico, and Los Angeles is very desirable, and specially is it desirable that arrangements be made to be ready to develop a strict quarantine system at any moment, and for this purpose the Secretary is hereby ordered to proceed to San Francisco, and confer with the railroad authorities, that coöperation with them may be secured, and report the result of the same at the next quarterly meeting.

On motion, meeting then adjourned.

G. G. TYRRELL,
Secretary.

The Regular Quarterly Meeting of the State Board of Health,

Was held in the office of the Secretary, Saturday, April 23, 1887, at the usual hour.

Present—Dr. Orme, President; Dr. Tyrrell, Secretary; Dr. H. C. Crowder, and Dr. J. M. Briceland. Absent, Drs. Cluness, Simpson, and Cole.

The minutes of the last meeting, and those of the special meeting, having been read and approved, the Secretary read a communication from Dr. Borde, relative to the sanitary condition of Tulare City, and also noting the absence of smallpox or other contagious diseases upon any of the trains he had inspected; which, on motion, was ordered placed on file.

The Secretary also read a communication from Dr. J. J. Choate, Medical Inspector at Colton, informing the Board of the absence of smallpox.

A telegram was received from Dr. Hagan, Health Officer at Los Angeles, by request of Dr. Orme, informing the Board of the condition of Los Angeles at the present time. The telegram read: "Not a case of smallpox in the city except two in hospital."

A telegram was also received from Dr. T. L. Magee, Health Officer at San Diego, which read: "Dr. Hillery reports a case of smallpox at Linda Vista, in the Mosher family." The telegrams were ordered on file.

The Secretary then read a communication from Deputy Collector of Customs at Yuma, offering to coöperate with the Board, and informing it that Dr. De Corse was duly appointed Inspector or Quarantine Officer at that city. The letter was ordered answered and placed on file.

A communication was also received from John Eitel, of Sacramento, appertaining to the sanitary care of rivers and the destruction by fire of all garbage and refuse matter, which was ordered placed on file.

A letter was also read from the Chief Signal Officer, asking for a set of our biennial reports, which was, on motion, granted and a set ordered to be furnished his office.

The Secretary then read the following report of the result of his conference with the railroad officials, as directed at the last meeting of the Board:

In accordance with instructions, your Secretary proceeded to San Francisco and there called upon J. A. Fillmore and R. H. Pratt, Superintendent and Assistant Superintendent of the Southern Pacific Railroad Company, and explained to them the situation and the urgent necessity that existed of guarding the avenues of egress which their roads had opened from Los Angeles to the transportation of smallpox. These gentlemen were very courteous, and expressed their willingness to do anything in their power to prevent the spread of smallpox in our State, and fully agreed with this Board as to the necessity of placing Medical Inspectors on the trains leaving the infected district. They offered free transportation to our appointees if we would go south and attend to the details. Accordingly I submitted to Drs. Cole, Crowder, and Simpson the result of our conference, and suggested that they would go south with me, meet Dr. Orme, our President, and take what action might be necessary as a Board with power to act. Such action being deemed prudent, Drs. Cole, Crowder, and your Secretary left San Francisco for Los Angeles and the southern frontier, April 12, 1887. We arrived in Los Angeles on the thirteenth, when we were joined by Dr. H. S. Orme, President of the Board. It being the Sabbath day, we were driven round the city to take into consideration its topography, water supply, drainage, sewerage, and general sanitary condition, and as to how and where the cases of smallpox were quarantined. We also viewed the smallpox hospital and grounds, which were considered quite inadequate for the purpose designed, or for the wants of a large city like Los Angeles.

On Monday, April thirteenth, a quorum being present, the State Board of Health held a special meeting, at which were present W. H. Workman, Mayor of the city of Los Angeles, Supervisor Rowan, Health Officer Dr. M. Hagan, Dr. J. S. Baker, ex-Health Officer, Drs. Turner, Kuntz, and Ross.

After hearing the statements of Mayor Workman, Health Officer M. Hagan, Drs. Baker, Turner, and others, relative to the prevalence of smallpox, and the means taken for its suppression, Dr. Orme stated that up to that time they had thirty-three cases in the city, had them all quarantined, but thought that more vigorous measures ought to be taken at once with a view to "stamping out" the disease.

The Board of Health of Los Angeles consisted of the Mayor, the President of the Council, and three Councilmen, the Health Officer being an ex officio member.

After a prolonged discussion among the members of the State Board of Health, it was resolved that the following recommendations be tendered to the Mayor and Council, as the advice of the State Board of Health:

First—We recommend that a special Board of Health be appointed, consisting of the Mayor and four qualified physicians, who shall take sanitary charge of the city, and be invested with full powers in the present emergency.

Second—It being indisputably necessary that all cases of contagious disease shall be immediately reported to the Health Officer, we recommend that a neglect to perform this duty, upon the part of the attending physician, hotel keeper, lodging house keeper, or head of the family, shall be deemed a misdemeanor, and punished by fine, imprisonment, or both.

Third—The State Board of Health recommended universal vaccination and revaccination as often as an epidemic of smallpox is threatened, and that no child be permitted to attend the public schools who does not present a certificate of successful vaccination within five years, signed by a legally qualified physician. We further recommend that the city be immediately districted, and a duly qualified vaccinator be appointed to each district, whose duty it shall be to make a house to house inspection and vaccinate all who are unprotected.

Fourth—We recommend that a building be erected for the detention of all persons who have been exposed to the action of smallpox, or are suspected of having the disease, who shall be detained for not less than twelve days, or until the disease has manifested itself unmistakably.

Fifth—That in all deaths from contagious disease, public funerals be prohibited, and that all persons dying of contagious diseases be disinfected before or at the time of burial, and that interment be made as soon as practicable.

Sixth—That we recommend that an ordinance be passed making it a misdemeanor, punishable by fine, imprisonment, or both, for any hackman, driver, or owner of a public vehicle, to convey any person or persons sick with any contagious or infectious disease.

Seventh—We recommend that all persons suffering from smallpox in any hotel, lodging house, boarding house, or other tenement occupied by more than one family, shall be promptly removed to the smallpox hospital, and, when necessary, sufficient force shall be employed for that purpose.

Meeting now adjourned until 7:30 P. M.

Adjourned meeting held in rooms of Board of Trade at 7:30 P. M. The Board of Trade and City Council being present, Dr. R. Beverly Cole, in his usual masterly style and impressive manner, presented the recommendations of the State Board of Health, and offered them as the opinion of the Board, being the advisory Board of the State on matters concerning its sanitary interests. He explained most lucidly our purpose to the gentlemen present, and that as an advisory Board we could only recommend, our main object being the prevention of the spread of the disease beyond its present limitations. A mistaken notion had arisen that our visit was for the purpose of quarantining Los Angeles, which he assured the Council we had no power to do, neither did we express any such intention.

Dr. Jas. Simpson then addressed the meeting, and in eloquent terms assured the Council that the desire of our Board was to coöperate with the city authorities in taking the speediest methods of stamping out the disease and preventing its spreading throughout the State.

The Mayor and gentlemen present having thanked us for our interest in the welfare of the city, and promising to adopt our advice, the meeting of the Board adjourned.

March sixteenth, Doctors Orme, Crowder, Cole, and your Secretary went to San Diego, arriving in that city on the morning of March seventeenth. We learned that one case of smallpox had been discovered, in the person of a woman who had come from El Paso, Texas. She died in a few days, and no new case had developed at the time of our arrival. We visited the smallpox hospital, which is admirably situated on the "mesa," or tableland, above the city, and away from all possibility of infecting others, being isolated and capable of thorough ventilation. It was unoccupied except by the husband of the deceased woman referred to. He was in good health and detained as a precautionary measure until all possible danger from him had passed. At this city we engaged the services of Dr. T. L. Magee to board all trains and ships coming into San Diego, and gave him a copy of instructions for his guidance.

Returning to Colton we learned that there was no smallpox there, but at this point roads coming from the East intersect. We placed there two Inspectors, Dr. Jas. J. Choate and Dr. C. B. Brierly, who would run on alternate days, one to Indio and inspect the Southern Pacific trains, the other to Barstow and inspect the California Southern trains. We also commissioned Dr. M. F. Price, of Colton, as consulting physician, in case either Inspector needed his services.

We next visited San Pedro and Wilmington, and as this is a port of ingress from Mexico, and departure from Los Angeles, we placed Dr. W. A. Weldon here, whose duty will be to inspect all trains and ships arriving and departing.

Returning to Los Angeles we appointed Dr. Q. J. Rowley a Medical Inspector, and stationed him at Mojave to inspect all trains arriving from Los Angeles and the East. Learning, however, that two trains passed Mojave at midnight, and not wishing to disturb the passengers at that unseasonable hour, we appointed Dr. H. J. Bordé an Inspector and stationed him at Tulare City with orders to inspect the trains that passed Mojave without scrutiny. We thus placed a cordon of Inspectors embracing all points through which contagious disease might find its way into the interior of the State.

The following is a copy of instructions given to each Inspector, and posted at each station where our Inspectors are employed:

STATE BOARD OF HEALTH.

Instructions to Medical Inspectors for State Board of Health.

—— ——, *M.D.*:

DEAR SIR: You are hereby appointed Medical Inspector for the State Board of Health for the district between —— ——, and the following general rules are published for your guidance:

You will take a convenient position at your assigned station and inspect the emigrant cars on their arrival, at the same time making inquiries of the passengers as to the existence of any sickness on board at the time, or as to there having been any eruptive form of disease among them since leaving —— ——. In this investigation valuable information may be obtained from the conductor and other employés of the train.

Should any case of smallpox be discovered upon any car, you will direct said car to be quarantined, or side-tracked, at a point suited to the well-being and comfort of the sick, and at the same time adapted to the convenience of the railroad company. It is desired that the work to be done should be so ordered and conducted as to subject the company to the minimum of inconvenience consistent with its energetic and efficient discharge in the interest of public health.

The other passengers on infected cars should be transferred to another car, but not mixed with passengers on uninfected cars. You will examine them carefully to ascertain whether there are any unvaccinated persons among them. All such should be immediately vaccinated, making at least two points of insertion. You will also vaccinate all upon the infected car, and detain them for a period of twelve days from the date of their exposure to the disease.

You will also inspect the express trains, and satisfy yourself that no cases of smallpox were on board. In this examination the conductor and other employés of the cars will be of essential service to you. Should you be satisfied of the presence of smallpox, you will adopt the means just recommended for emigrant cars.

If, upon inquiry, you find that any passenger upon a car has been sick with smallpox during the trip, and has died or been removed from the car, you will consider such car to be infected, and proceed therewith in the manner directed for cars upon which smallpox has actually been discovered.

When any car containing smallpox has been quarantined, you will aid the railroad authorities in seeing that the passengers thereon are well and comfortably cared for, and that the car, after the recovery or removal of the sick, is thoroughly disinfected, according to the rules laid down in the general instructions for disinfection issued by the State Board of Health.

You will be expected to keep a record of cars quarantined, cases of smallpox discovered, and vaccinations and revaccinations performed, and of every other proceeding under the duties assigned you, and to report the same in writing to the Secretary of the State Board of Health at Sacramento at least every third day.

The duties to which you are assigned are important yet delicate, and the State Board of Health trusts to your discretion and good judgment so that they be exercised with prudence, and with an endeavor to disarm opposition by a courteous and dignified appeal to reason, and the demonstration of the necessity of the measures adopted, rather than by the exhibition of arbitrary authority.

By order of the State Board of Health.

G. G. TYRRELL, M.D.,
Secretary State Board of Health, Sacramento.

On motion of Dr. J. M. Briceland the report was received, the action of the Board concurred in, and the proceedings ordered spread upon the minutes.

The Secretary informed the Board that the Inspectors appointed were doing their duty nobly and faithfully, and that so far no cases of contagious or infectious disease had passed their stations.

Dr. Orme stated that on April eighth he had received an urgent request from the City Trustees and the Health Officer, Dr. Magee, that he would visit San Diego officially, to give his advice and opinion on some cases of a doubtful nature, which the Health Officer had removed to the Smallpox Hospital. Dr. Orme immediately responded, and found six cases of well marked smallpox in the hospital, confirming Dr. Magee's opinion, and establishing his correctness as a diagnostician and his prudence as a health officer.

In the evening a meeting of the City Trustees was held, and expressions of thanks were tendered to Dr. Orme and the State Board of Health, and resolutions appreciative of its efforts to assist the authorities in "stamping out" smallpox were passed.

After a full discussion of the present situation regarding smallpox, it was, on motion of Dr. J. M. Briceland—

Resolved, That if no new cases of smallpox developed between this time and the first of May next, our Secretary be instructed to discharge from duty our Medical Inspectors until such time as their services may again be required. We, however, deem it prudent to retain Dr. T. L. Magee on duty until the danger to San Diego has passed.

Carried.

Resolved, That the State Board of Health deprecate the attempts of a minor portion of the press in Southern California, and more especially of Los Angeles, to belittle the work of the State Board of Health, in attributing its efforts to suppress disease to any sectional feeling or desire to injure the southern part of the State, as this Board expends its efforts for the good of the whole State, and not for any particular part thereof.

Dr. Orme stated to the Board that Colonel George E. Waring was on the coast, and congratulated the City of San Diego for its enterprise in having a system of sewerage designed and executed by so eminent a sanitary engineer, and hoped that other cities interested in the welfare of their inhabitants would take the opportunity of Colonel Waring's visit to California to enlist his services in the carrying out of a perfect system of sewerage and drainage wherever needed.

There being no further business before the Board, on motion, it adjourned.

G. G. TYRRELL,
Permanent Secretary.

The Regular Quarterly Meeting of the State Board of Health,

Was held in the office of the Secretary, July 22, 1887, at the usual hour.

Present—Dr. H. S. Orme, President; Dr. Tyrrell, Secretary; Dr. W. R. Cluness, Dr. J. M. Briceland, Dr. H. C. Crowder.

The minutes of the last meeting having been read and approved, the Secretary read a communication from Dr. James Simpson, explaining his inability to attend the meeting owing to indisposition, and promising to report the status of smallpox in San Francisco to date.

A letter was also read from Professor R. Beverly Cole, dated from Calistoga, explaining his absence, and expressing his regrets at his unavoidable detention.

The Secretary then read a communication from Surgeon-General Hamilton, notifying the Board that in compliance with its request he had appointed Inspectors at Yuma and Nogales to guard against the approach of contagious disease at these points.

A communication was read from Dr. De Corse, Health Inspector at Yuma, giving information relative to smallpox on the border, and the precautions taken to prevent its entrance into California, which was ordered placed on file.

A communication from Dr. Crepin, Health Officer at Tucson, was also read, giving an account of the progress of smallpox in that city, which was also ordered on file.

The Secretary stated that he had received an answer to a dispatch sent to Dr. Walsh, regarding smallpox in Irvington. Dr. Walsh stated that there were three cases there in one family, and, in accordance with instructions from this Board, has placed a quarantine upon the house and isolated the family.

A case of smallpox was also reported in Oakland, which the Health Officer had in charge.

The Secretary informed the Board that he had telegraphed to Dr. J. L. Meares, the Health Officer of San Francisco, of the meeting of the Board this evening, with the request that he telegraph the number of cases of smallpox that had been reported in San Francisco since its outbreak three weeks ago. No answer had been received, and he was therefore unable to inform the Board to-night. Smallpox is, however, in San Francisco, and slowly spreading among the unvaccinated.

A communication was read from the Lick Paper Company, relative to an open sewer running past the Asylum for the Chronic Insane and their mill, and asking the action of the State Board in having the nuisance abated.

The Secretary informed the Board that he had replied to the communication and pointed out the course to be pursued by the mill company.

The letter was ordered placed on file, and the Secretary's course approved.

The Secretary then informed the Board, that for the past two sessions of the Legislature the Board had received a great deal of legal advice and clerical work performed in drawing bills relative to the laws of health from Hon. E. W. Maslin, who had received no compensation therefor, and thought the matter ought to be settled at once, as advice is occasionally needed in the interest of the Board.

Dr. Orme moved that the sum $100 be drawn from the appropriation for the expenses of the Board and awarded to Mr. Maslin for legal services, and the Secretary be instructed to charge same among regular expenses when sending in his monthly expenditures to the Board of Examiners, which was carried unanimously.

The Secretary called attention to the necessity of rearranging the standing committees before commencing work on the next biennial report. It was therefore, on motion of Dr. Cluness—

Resolved, That the Secretary rearrange the committees, and present the same at the next regular meeting of the Board.

On motion:

Resolved, That any member of the State Board of Health who can attend the meeting of the National Conference of State Boards of Health and American Public Health Association, is hereby appointed a delegate, and that the Secretary furnish such member credentials as representative of this Board.

Which was carried.

Dr. Orme then read his report upon the epidemic of smallpox in Los Angeles, which occurred in this year. A synopsis of the report shows that the first cases were reported February 16, 1887. Next day four other cases were discovered, one of these at South Pasadena. Three others were added on the eighteenth; another on the nineteenth, making in all ten cases since the sixteenth of February. All of these cases were in young men, which, taken with the fact of their being almost simultaneously affected, would indicate a common source of infection. Investigation confirmed this theory, as it was proved that all of these young men were in the habit of frequenting a certain theater in the city where it is supposed that the infection was introduced by the clothing of some visiting Mexicans, smallpox being known to have existed in Mexico at that time. Of the ten cases, one died at South Pasadena on February twentieth, and four more in the city on the twenty-second. As a sequence, a city crowded with thousands of health and pleasure seekers, was on the verge of a panic. Reports now began to come in from other localities. In Lugo settlement, Downey, Elsinore, Ravenna, Ballona, and Green Meadows cases developed. It reached San Diego, and down to Ensenada, on the Gulf of California.

The prevalence of smallpox continued from the sixteenth day of February to June, 1887. During that time one hundred and twenty cases occurred in Los Angeles, with fifteen deaths. In the County of Los Angeles there were fifty-six cases, with six deaths. In San Diego there were twelve cases, with two deaths. In Elsinore there were three cases and two deaths. In Ontario there were two cases, in Ventura two cases; making a grand total of one hundred and ninety-six cases and twenty-five deaths. The mortality was about 12½ per cent, which is much less than usually observed in epidemics of this kind. A noticeable fact is the general absence of the usual disfiguration, very few cases showing any trace of pitting, on recovery from the disease, which indicated its generally mild character. Los Angeles, at the time of the invasion, was crowded with strangers, and it is estimated that at least ten thousand people fled from the city, to avoid contagion. This was, in a great measure, owing to the San Francisco and other papers exaggerating the extent of the epidemic, and the action of the local papers in trying to conceal the fact that smallpox existed. Dr. Orme, at the very outset of the epidemic, addressed a letter to the Supervisors, advising them of the presence of the disease, and of the remedial measures to be adopted, offering the services of the State Board of Health in endeavoring to allay the excitement and exterminating the disease. Accepting Dr. Orme's suggestions, the State Board of Health had circulars printed, upon the management of smallpox, and distributed throughout the city and county. Dr. Orme personally superintended the appointment of efficient and competent physicians to act in the emergency. The disease becoming still more formidable, the President deemed it his duty to call the State Board of Health together for consultation, which met, and, in conference with the Mayor and City Council, gave such recommendations as seemed to them to be adapted to the occasion. It was also decided to consult with the railroad authorities, and place medical inspectors along the route of travel, to prevent the disease extending through the State. The report then narrates the different means adopted in this city, the placing of the sick under the charge and care of the Sisters of Charity, etc., and gives the expenses of the four months during which the epidemic existed as $18,000 for the city, and $21,000 for the county, and incidentally, he says, many more thousands must be added to our expenses. In fact, says the report, nothing could be done in connection with the disease that did not cost a fabulous price. In conclusion, the doctor notices the extreme bitterness of the Los Angeles press upon the event of the State Board's visit to that city, and condemns its unnecessary hostility on that occasion.

On motion of Dr. Briceland, the report was accepted and ordered printed in the next biennial report of the Board in extenso.

There being no further business before the meeting, it, on motion, adjourned.

G. G. TYRRELL,
Permanent Secretary.

THE REGULAR QUARTERLY MEETING OF THE STATE BOARD OF HEALTH,

Was held in the office of the Board, October 15, 1887.

Present—Dr. H. S. Orme, President; G. G. Tyrrell, Secretary; Drs. Simpson, R. B. Cole, H. C. Crowder, and J. M. Briceland. Absent—Dr. W. R. Cluness, who was absent from the city.

The minutes of the last meeting having been read and approved, a communication was read from the editor of the "Sanitary News," and ordered placed on file.

A bill for $2 subscription to the "Sanitary News" was presented and ordered paid.

The Secretary then read a communication from Dr. C. A. Lindsley, Secretary of National Conference of State Boards of Health, announcing an assessment of $5 on each State Board of Health, to defray expenses of Conference, which, on motion of Dr. H. C. Crowder, was received, and the assessment ordered paid.

The following communication was received from the National Conference of State Boards of Health:

Secretary's Office, New Haven, Conn.,
September 17, 1887.

Dear Sir: At the session of the National Conference of State Boards of Health, held in Washington September 8, 1887, the Committee on Interstate Notification made the following report:

Report to the International Conference of State Boards re *Notification of Infectious Disease.*

Your committee begs leave to report the following resolutions:

Resolved, 1. That the Conference reaffirms the principles contained in the resolutions adopted by it at its meeting in Toronto, 1886.

2. That those communicable diseases hereinafter mentioned, prevalent in certain areas, or which tend to spread along certain lines of travel, be reported to all State and Provincial Boards within said area or along said lines of communication.

3. That in the instances of smallpox, yellow fever, cholera, and typhus reports be at once forwarded, either by mail or telegraph, as the urgency of the case may demand; and, further, that in the instances of diphtheria, scarlet fever, typhoid fever, anthrax or glanders, weekly reports where possible be supplied, in which shall be indicated, as far as known, the places implicated and the degree of prevalence.

All of which is respectfully submitted.

PETER H. BOYCE,
HENRY B. BAKER,
J. BERRIAN LINDSLEY,
BENJ. LEE,
J. F. REEVES,
E. M. HUNT,
Committee.

The report having been read, it was voted that the vote on its adoption be taken by States. The vote, being so taken, was unanimous in its favor, by all the States and Provinces represented by delegates present.

The following resolution, offered by Dr. Reeves, of Wisconsin, and amended by Dr. Lee, of Philadelphia, was adopted:

Resolved, That the Secretary of this Conference be requested to send copies of the resolution on Interstate Notification of Contagious Diseases to the executive officers of all Boards of Health belonging to this Conference, and to request from each of such Boards as are not represented here a vote upon the same, for record as an appendix to the minutes of this meeting.

If your State was not represented by a vote at the Conference, will you please inform the undersigned of the vote of your Board, in compliance with the last resolution, at your earliest convenience.

Very respectfully,

C. A. LINDSLEY,
Secretary of the Conference.

On motion of Dr. R. Beverly Cole, it was regretted that this Board was not represented at the last Conference of State Boards of Health, and that we are heartily in sympathy with the spirit of the resolution offered, and desire to record the vote of this Board in the affirmative, which was carried unanimously.

The Secretary presented and read a communication from Mr. Richard Gray, General Superintendent Freight Department, Southern Pacific Railroad Company, asking the Secretary of this Board to telegraph Dr. R. Rutherford, Health Officer of Houston, Texas, that this coast was free from cholera, and that the quarantine placed on fruit coming from this State was unnecessary on the part of the State Board of Health of Texas.

The Secretary informed the Board that he had answered this communication, and sent a copy of the following dispatch:

October 6, 1887.

Dr. R. Rutherford, *State Board of Health, Houston, Texas:*

If your quarantine of fruit includes California, it is wholly unnecessary, as no cholera has existed in this State for thirty years. Please answer.

G. G. TYRRELL,
Secretary California State Board of Health.

To which Dr. Rutherford sent the following reply:

To G. G. Tyrrell, *Secretary California State Board of Health:*

Fruit from California not quarantined, only it must be accompanied by affidavit, so that I may know that it is from California.

R. RUTHERFORD,
Secretary Texas State Board of Health.
Houston, Texas.

He had also telegraphed to Mr. Gray the result of his action, which seems to be satisfactory to the railroad company.

On motion, the action of the Secretary was indorsed and approved by the Board.

Dr. Simpson moved that the Secretary be authorized to enter into communication with the Southern Pacific Railroad Company, if necessary, and also Health Officer Rutherford, and take such action as he deems best for the interest of California under the various changing conditions that may arise appertaining to the question of interstate quarantine, which was carried.

Dr. R. Beverly Cole moved that the Secretary be authorized to have executed a new and appropriate seal for the use of the Board. Carried.

The Secretary having been appointed at the last meeting of the Board a committee to report upon changing the standing committees, reported that the committees heretofore organized by the Board are well adapted for the duties imposed upon them, and recommends that they be continued as heretofore, which, on motion of Dr. R. B. Cole, was accepted and the committees continued.

On motion of Dr. R. B. Cole, it was—

Resolved, That each member of this Board be requested to visit at least one of our public health resorts during the coming season, and prepare a report, based upon his observations and investigations, as to its sanitary condition.

Which was carried.

Dr. Simpson moved that the Secretary be requested to prepare a list of our public health resorts, and furnish a copy to each member of the Board, with a view of selecting the points he may find most convenient to visit; and upon the selection being made by a member, the Secretary is instructed to notify the proprietor or occupier that such a member is designated to visit and report upon the sanitary condition of the establishment; which was adopted unanimously.

Dr. H. S. Orme moved that the Secretary be requested to place himself in communication with Surgeon J. B. Hamilton, U. S. M. H. Service, notifying him that it is currently reported that smallpox, in a virulent form, prevails in the village of Tubac, between Nogales and Tucson, Arizona Territory, and that we deem it our duty to call his attention to the fact, with a view of his investigation of the same, and, if thought best, to renew the quarantine on the border to prevent its spread over the Territory, which was adopted.

The Secretary presented the monthly circular just published, which met the approval of the Board.

There being no further business, the meeting adjourned.

GERRARD G. TYRRELL,
Permanent Secretary.

The Regular Quarterly Meeting of the State Board of Health,

Was held in the office of the Secretary, January 5, 1888.

Present—Dr. H. S. Orme, President; G. G. Tyrrell, Secretary; Dr. W. R. Cluness, Dr. R. B. Cole, Dr. H. C. Crowder, Dr. J. M. Briceland, members, and Dr. C. A. Ruggles, Stockton, by invitation. Absent—Dr. Jas. Simpson, San Francisco.

The minutes of the last meeting having been read and approved, a communication was read from the National Conference of State Boards of Health in reference to questions for discussion at the next meeting of the Conference. Communication was received and ordered placed on file.

It was also moved that a committee of two members of this Board be appointed to represent this Board, and to formulate a question or questions to submit to the Conference of State Boards of Health, and that each member of this Board is hereby requested to send, within ten days from date, such questions to the committee as they would like to have considered by it, and that the action of this committee be accepted as the action of the Board, which was unanimously carried. The President appointed Dr. R. B. Cole and Dr. W. R. Cluness as that committee, the Secretary being ex officio a member.

A communication was received from the Board of Health of San Francisco asking the State Board of Health to aid it in "stamping out" smallpox, now prevalent in San Francisco, by appointing Inspectors on trains coming into the State, and out of San Francisco, to prevent the spread of the disease, which, on motion, was read and placed on file.

A communication from the American Public Health Association was read, asking a contribution of $5 as dues to the Association, which, on motion, was authorized to be paid by the Secretary.

A communication from Dr. Lindsley, Secretary of Conference of State Board of Health, inclosing a form of notification of infectious disease, was read, and on motion of Dr. H. C. Crowder, it was resolved that the Secretary is instructed to have a somewhat similar form printed for the use of this Board, and that the Secretary be requested to notify other States of the presence of a limited number of cases of smallpox in California, which was carried.

On motion of Dr. R. B. Cole, the Secretary was instructed to have one thousand copies of a circular printed, intended as a guide in the formation of local Boards of Health, for Supervisors, Trustees, or Councilmen, and also defining the duties of Health Officer of the same, which was carried.

A letter from Dr. Probst, Secretary of the State Board of Health of Ohio, was read, inquiring how many copies of the proceedings of the Conference of the State Boards of Health will be required by this Board. After some discussion, it was, on motion of Dr. J. M. Briceland—

Resolved, That this Board order three hundred copies of the publisher for distribution, and that a copy be sent to each of the correspondents of this Board, and to every Board of Health in the State.

Which was carried.

Dr. Cluness moved that twenty thousand copies of the Board's circular on smallpox be reprinted, with whatever additional remarks on vaccination that the Secretary may deem suitable at this time, which was carried.

The Secretary stated that at the request of the President he had addressed an official communication to the Board of Supervisors of Los Angeles County, asking them to appoint a Health Officer for the town of San Pedro, or Port of Wilmington, information having been received that the sanitary condition of that town was in such a deplorable state as to foster and propagate infectious or contagious disease if such should be developed. The Supervisors in their reply stated they would give the matter their earliest attention.

On motion, the action of the Secretary in this matter was indorsed and approved.

The Secretary reported that on December 14, 1887, he had visited Truckee, Nevada County, officially, to examine into the cause of the frequency of typhoid fever in that town, especially among young girls, and discovered that the privies attached to the school house where the children went were in a most insanitary condition, the department used by the girls being devoid of ventilation, except through a hole at the back of the seat, which carried the polluted air right under the children as they sat down, and out into the closet. This privy had been used by a child suffering from typhoid fever.

On motion, the Secretary was ordered to elaborate this report when making his biennial report to the Board. Carried.

The Secretary read the following communication from the Board on "Vaccination," which was ordered spread upon the minutes:

VACCINATION.

A Timely Warning from the State Board of Health.

The State Board of Health, being advised of the gradual progress of smallpox in several parts of the State, deems it its duty to warn the public against delay in availing itself of the only known prophylactic against the disease, namely, vaccination. The supply of pure bovine virus upon the coast is now ample, its use is almost perfectly devoid of danger, and its protective power to guard the system against the invasion of smallpox is unquestioned; if in a few isolated instances, through some peculiarity of constitution, smallpox is contracted after successful vaccination, the disease is modified or rendered so mild as to be comparatively without danger. From the fact that this State has been free from smallpox for so many years there is necessarily a large number of persons in our midst who are susceptible to the disease. Once smallpox is fairly started this fresh food for its maintenance is sufficient to render the disease epidemic in many places and the loss of valuable lives a certainty. To say nothing of this, its humanitarian aspect, the monetary loss an epidemic would cause our citizens and the injury it would produce in the brilliant prospects of our State is beyond computation.

These dire but positive results can all be avoided, death averted, and perfect safety assured by efficient vaccination.

The Board advises, therefore, immediate action. Let competent physicians be appointed in every city and town in the State as public vaccinators, and if necessary offer this God-given boon free to all. There is no city, town, or hamlet that can, for pecuniary consideration, afford to harbor a single nidus for smallpox when the means of prevention are so certain, so easy, and so positively effectual.

H. S. ORME, M.D.,
President.
G. G. TYRRELL, M.D.,
Secretary California State Board of Health.

The Secretary read a communication from the German Vice-Consul, relative to the death of a person, a certificate of which was required to establish his identity. This was read for the purpose of showing the necessity of having our statistics and registration of deaths rendered as nearly correct as possible, which can only be done by changing the law so as to make registry by County Recorders compulsory.

On motion, it was—

Resolved, That the Committee on Legislation be instructed at the next meeting of the Legislature to attend to this matter, and use all legitimate means to have our present laws changed so as to make them efficacious.

The Secretary reported the appearace of smallpox in Sierra City and Sierra Valley; also one case in North Bloomfield, Nevada County; one in Redding, Shasta County; one in Cloverdale, one in Healdsburg, two in Olema, Marin County; one in Lake County, two in Stockton, two in Solano County, several in Oakland, and eighty-six in San Francisco, up to January 1, 1888.

A communication was read from Governor Waterman, authorizing the Board to adopt whatever means were necessary to arrest the spread of contagious disease, which, on motion, was read and placed on file.

Dr. Cluness moved, which was seconded by Dr. Briceland, that in view of the prevalence of smallpox, the Secretary be instructed to communicate with the Supervisors of every county throughout the State, and urge upon them the necessity of establishing local Boards of Health in their districts and instruct them as to the best methods of preventing smallpox, by forwarding to them official circular pamphlets appertaining to the disease, and issued by the Board; which was unanimously carried.

A communication from the Health Department of San Francisco, requesting the appointment of Inspectors, being the next subject under discussion, the question arose as to the benefit to be derived by appointing Inspectors, the disease being already in the State. Dr. R. B. Cole was of the opinion that we could not arrest the spread of smallpox by inspecting trains, as persons afflicted, but on whose person the disease had not shown any outward signs, could not be detected in the short time consumed in traveling from San Francisco to any part of the State, and therefore was opposed to placing Inspectors on the trains.

Dr. Cluness differed from Dr. Cole. He thought the effect would be good; in the first place, by giving confidence to the public that every precaution was taken to insure their safe travel, and again, it would prevent the travel of any with the disease broken out on them. If such attempted to travel, as we know they do, and without any inspection of the trains, such sources of contagion might be allowed to infect every susceptible person on the train without hindrance. Therefore, as a measure of precaution, and for the moral effect it would have upon the traveling public, he would move that an Inspector be appointed for Tulare, San Pedro, Santa Barbara, San Diego, and Truckee, which, being ably seconded by Dr. J. M. Briceland in a convincing speech, was carried; Dr. Cole voting "No."

Dr. Cluness thought that these Inspectors should be requested to impress upon the community among whom they were placed the fact that vaccination and revaccination alone can be relied upon for protection against smallpox, and that they coöperate with the local authorities in the endeavor to prevent the advent or the spread of the disease.

It was moved by Dr. R. B. Cole, and seconded by Dr. Cluness, that the Inspectors be paid a salary not exceeding $100 a month, which, after some discussion, was carried.

It was moved by Dr. R. B. Cole that the Secretary be authorized to supply the representatives of this Board with bovine virus without charge, and also local Boards of Health, upon evidence of their inability to furnish the same at their own expense, which was carried.

When upon the subject of the reliability of virus, Dr. Cluness desired to say that, in his opinion, the utility of bovine was much exaggerated; that he did not believe one third of the virus used had any protective power whatever, and that not one quarter of those vaccinated took; whereas ninety-nine out of one hundred vaccinated with fresh humanized virus gave the characteristic result in a perfect vesicle. He did not believe that humanized lymph, taken on the eighth day and before inflammatory products had appeared, was capable of producing any disease in the human body; and, for himself, would just as soon be vaccinated with the lymph taken from a patient the victim of leprosy as any other, provided it was taken when in the proper stage and manner. He strongly advocated the use of humanized lymph in preference to bovine, when possible to procure it.

The assertion of Dr. Cluness gave rise to quite an animated discussion on the merits and demerits of bovine virus, the majority being inclined to prefer the bovine when reliable, although agreeing that it was not so successful in producing the characteristic vesicle as humanized virus in as many cases operated upon.

Dr. R. B. Cole moved that the Secretary be authorized to communicate with the Representatives of California in Washington, and that they urge the passage of the bill prepared by this Board to establish a quarantine station in the Bay of San Francisco, and that his Excellency Governor Waterman be requested to send a communication indorsing the same to our Senators and Congressmen, which was carried.

There being no further business, on motion of Dr. Briceland, the meeting adjourned.

GERRARD G. TYRRELL,
Secretary.

The Regular Quarterly Meeting of the State Board of Health,

Was held in the office of the Secretary, April 16, 1888.

Present—Dr. Orme, President; Dr. Tyrrell, Secretary; Dr. Briceland, Dr. Cluness, Dr. C. A. Ruggles.

The minutes of the last meeting having been read and approved, Dr. C. A. Ruggles, appointed to fill the vacancy caused by the expiration of the term of office of Dr. H. C. Crowder, presented his credentials and was welcomed to a seat at the Board.

Dr. H. S. Orme, Dr. W. R. Cluness, and Dr. J. M. Briceland, having been reappointed members of the Board, vice themselves, presented their qualifications and took their seats.

The Board then reorganized by electing Dr. W. R. Cluness, President pro tem., and Dr. Tyrrell, Secretary pro tem.

Dr. Briceland nominated Dr. H. S. Orme as President of the Board, which was seconed by Dr. C. A. Ruggles, and he was unanimously reëlected.

Dr. C. A. Ruggles nominated Dr. G. G. Tyrrell as Secretary of the Board, and he was unanimously reëlected.

The following committees were then appointed, subject to such changes as may be deemed necessary hereafter:

1. On the Salubrity of Public Institutions, Schools, Hospitals, Prisons, Factories, etc.—Doctors Cole, Orme, and Simpson.
2. On Statistics relating to Life and Health, Modes of Employment, and of Living, and the Comparative Healthfulness of different localities—Doctors Cluness, Briceland, and Tyrrell.
3. On Intoxicating Liquors, Inebriate Asylums, Pathological Influence of Alcohol, etc.—Doctors Simpson, Cole, and Ruggles.
4. On Influence of Irrigation, Tree Planting, etc.—Doctors Ruggles, Orme, and Cluness.
5. On Legislative Business—Doctors Briceland, Orme, and Tyrrell.

On these committees the Secretary of the Board is ex officio a member.

The Secretary reported that he had notified the Supervisors of every county in the State of the necessity that existed for the establishment of local Boards of Health and Health Officers, and had sent them circulars of instruction for that purpose.

On motion, the action of the Secretary was approved.

The Secretary also reported that in accordance with instructions, Inspectors had been appointed in San Diego, San Pedro, Santa Barbara, and Tulare, with orders to inspect all steamers and trains going south, to guard as far as possible against the transportation of smallpox by either. An Inspector was not appointed for Truckee, as the county authorities had appointed Hon. G. W. Griffin, of that place, for similar purpose. The Inspectors were paid $100 per month, and employed until March first, when the necessity for their appointment having ceased, they were relieved from duty until further orders, by order of the President.

On motion, the action of the President and Secretary was approved.

The Secretary reported that he had supplied the Inspectors with bovine virus to the extent of $164 worth, which action, on motion, was approved.

The Secretary reported that he had issued a circular letter to the members of Congress in both houses regarding the quarantine bill introduced by Senator Stanford, and had received very favorable replies from many.

A communication was read from Dr. Edwards, of Philadelphia, asking our Board for its support in the publication of the "Annals of Hygiene."

On motion of Dr. Briceland, the Secretary was instructed to subscribe for seven copies of the "Annals" for one year.

A communication was received from the New Hampshire State Board of Health, asking the support of our Board by instructing our Representatives in Congress to favor the formation of a Bureau of Health.

On motion, the communication was received and placed on file for further consideration.

On motion—

Resolved, That the thanks of this Board be returned to our Representatives in Congress for their earnest efforts in behalf of this coast in the advocacy of the bill in relation to quarantine, introduced by Senator Stanford and drawn by this Board.

Which was carried.

Communication was received from Mr. Rudolph Hering, which was ordered placed on file, and the Secretary requested to ask a report upon the subject of sewerage for our biennial report, especially in relation to the City of Los Angeles, upon which Mr. Hering has already made a survey.

Dr. H. Dubois, of San Rafael, sent a communication asking the coöperation of the Board in the establishing of a reliable vaccine station in San Rafael.

Dr. C. A. Ruggles stated that in his experience, where he required quick and sure work, he relied upon humanized virus above all others. With bovine virus his failures amounted to over 35 per cent; whereas, with the humanized lymph, the failures were not even 10 per cent. He believed that sometimes bovine virus was not pure, being not unfrequently mixed with blood, and perhaps other extraneous matters. As far as the San Rafael virus is concerned he had tried it, but found it failed every time.

On motion of Dr. Cluness, it was—

Resolved, That the Pacific Coast Vaccine Station should be encouraged, and toward that end the members of this Board promise to give it a fair and impartial trial.

Which, after some discussion, was carried.

The Secretary read a communication which he had forwarded to the

"Sanitary News," giving a summary of the work of the Board up to the present time, which, on motion, was approved.

At the last meeting of the Board, the Secretary, Drs. Cole and Cluness were appointed a committee to prepare questions to be submitted to the National Conference of State Boards of Health, for consideration. In accordance therewith, the following questions were prepared and sent as proposed by the State Board of California:

a. Cannot a plan be devised to insure uniformity and increase of power in State Boards of Health by formulating, in conference, a draft of the extent of the increased powers desired in matters of quarantine, compulsory notification of contagious diseases, and other sanitary matters within each State, neglected or refused by local Boards, which formula may be expressed in a bill and laid before each State Legislature for passage?

b. What are the true characteristics of the vesicle in successful vaccination from bovine virus?

c. Can the cholera be communicated in any other manner than through the alimentary canal?

d. In the event of cholera reaching America, can it be prevented from becoming epidemic? If so, how?

Which, on motion, were approved as the action of the Board.

The Secretary read reports from the State Boards of Iowa, North Carolina, Illinois, Pennsylvania, Minnesota, Missouri, New York, Tennessee, Louisiana, Kansas, Wisconsin, and Massachusetts, announcing the appearance of smallpox in each of these States, which were ordered on file.

Dr. H. S. Orme, President of the Board, reported that he had officially visited Santa Barbara, Ventura, San Bernardino, and San Diego, for the purpose of giving such instructions as were needed to limit the extension of smallpox in these counties, and to advise with the local authorities as to their duties in providing for the quarantine of the sick and the protection of the people from contagion.

The Secretary reported that he had made official visits to Calaveras County and Watsonville, at the request of the authorities, to determine the nature of the diseases that prevailed in these sections of the country, and to give such advice as might be needed to quiet apprehension and arrest the progress of the maladies.

The actions of the President and Secretary were, on motion, approved.

Matters in relation to quarantine on the coast being under discussion, it was, on motion—

Resolved, That this Board do now adjourn to San Francisco, and invite the Board of Health of San Francisco to meet us in reference to coast quarantine, and the best means to be adopted to restrain the importation of smallpox through the Chinese immigration, both by sea and land.

Which was carried, and the meeting adjourned to meet in Dr. Simpson's office, Post Street, San Francisco, at 8:30 P. M., on April 17, 1888.

ADJOURNED MEETING OF THE STATE BOARD OF HEALTH,

Was held in the office of Dr. Jas. Simpson, April 17, 1888, at 8:30 P. M.

Present—Dr. H. S. Orme, Dr. G. G. Tyrrell, Dr. C. A. Ruggles, Dr. J. M. Briceland, Dr. R. B. Cole, Dr. Jas. Simpson, members of the State Board of Health, and Mayor Pond, Dr. Perry, Dr. McCarthy, Dr. Rosenstirn, of San Francisco Board of Health, and Dr. Barger, Health Officer of San Francisco.

A communication was read from the Board of Health of San Francisco tendering the use of the rooms of the Board of Health in the City Hall to the State Board whenever it decided to transact any of its business in

San Francisco, which, on motion, was received, placed on file, and the thanks of the Board returned to Mayor Pond and Board of Health.

Mayor Pond related his interview with Congressman W. W. Morrow, and was informed that the bill upon quarantine had been referred to the committee whose function it was to select such bills as were deemed most important to be acted upon. The bill was placed upon file for action, and Mr. Morrow was of the opinion that the bill will be brought up for consideration in a few weeks, with great probability of its passage by the House, and then he thinks there will be no trouble in getting it through the Senate.

Dr. R. B. Cole inquired if the number of bills ahead of the quarantine bill would not obstruct its passage.

The Mayor thought they would not, as Mr. Morrow was very energetic and would have the bill pushed to the front.

The Secretary then read for the gentlemen present the action of the State Board and the question proposed for the action of the Conference of State Boards of Health, as well as those proposed by other State Boards, in reference to quarantine, which were deemed important.

Dr. Simpson, in expressing his views upon the subject, was of the opinion that the State Board of Health should be represented at the meeting of the Conference, as it was most important that the urgency of a proper and efficient quarantine should be ably presented to the Conference.

Dr. R. Beverly Cole, recognizing the importance of having the State represented, inquired if there were no possible means of having ourselves represented.

The Secretary replied that the funds appropriated for the expenses of the Board were almost exhausted, and that not enough remained to send a delegate to Cincinnati and pay the current expenses of the Board.

Dr. R. B. Cole moved that—

WHEREAS, The regular appropriation for the use of the State Board of Health being insufficient to justify said Board in sending a representative or delegate to the National Conference of State Boards of Health, at their meeting in Cincinnati, May 4, 1888; be it

Resolved, That the Secretary be instructed to represent to the Governor the importance of this question, especially in the suppression of contagious and infectious diseases, in which this State is so deeply interested, and to request as the action of this Board, that he consent to the appropriation of a sufficient amount of the contagious disease fund to meet the actual expenses of sending a representative of this Board as a delegate to the National Conference of State Boards of Health, to be held in Cincinnati, May 4, 1888.

Dr. Briceland, while in perfect accord with the spirit of the motion, and fully impressed with the desirability of our Board being represented in matters of such vital importance to the State, was very doubtful of the manner in which our Legislature would view our action. It is a very hard matter to convince the modern legislator that money ought to be appropriated for such purpose. When we seek for a continuance of the appropriation next winter, we should have no record that could in any manner prejudice the Legislature against us.

Dr. Rosenstirn, of San Francisco Board of Health, remarked that this subject is not only important in regard to this State, but of national importance, and comes right under the very head for which this money was appropriated, for certainly the prevention of disease coming to the coast was the main object for which this money was designed. This Conference meets for discussing the best means whereby disease may be prevented, and without coöperation we will accomplish but little.

Dr. R. B. Cole could not see the application of Dr. Briceland's remarks; the principal object we have is to inform ourselves as to the best means to be adopted to suppress epidemic diseases, and except we ascertain and interchange views upon the subject we cannot possibly act with that degree of knowledge which is required of us; he thought it quite within the province of our duty to get all the information possible, and considered the use of the money appropriated for that purpose would be legitimately and correctly used in having ourselves represented at the Conference.

Dr. Jas. Simpson thought that Dr. Briceland spoke as a legislator, and was quite right in his remarks so far, but the progress of science was now so far advanced that the legislator could not but see that the importance of the subject demanded the utmost vigilance, and that we should use every means at our command to be thoroughly equipped against the invasion of pestilence to our shores.

Mayor Pond having at this time to retire, begged to assure the State Board of Health that the City Board would gladly coöperate with it in any means that might be desired to arrest the influx of disease from China, South America, Japan, or Mexico, and begged to assure the State Board that he was in perfect accord with it, and would be glad to have it use his offices whenever assembled for discussion of sanitary business.

Dr. Briceland was sorry to think Dr. Cole was at variance with his views, but when they come in contact with the average legislator, he would find it quite different. It is important that we should make plain our motives under which we act, as we must have another appropriation; it has become a necessity, and if we do anything to antagonize the Legislature, we will get nothing. He, as said before, was in full accord with the resolution, but begged we would do nothing that could place us in a false position before the Legislature.

Dr. Perry, of San Francisco Board of Health, agreed with Dr. Briceland, and did not know what we would accomplish by sending a delegate to the Conference, except by informing it what we might have to say upon Chinese immigration, especially in regard to smallpox and vaccination. It is a fact that Chinese land upon our shores with large scabs upon their arms, and yet they are not vaccinated, because, as the ship's surgeon says, that when they vaccinate them, the Chinese suck the wound, and then rub in some irritating substance that swells their arms, but does not protect them, producing, instead of a vesicle, an irritant sore that scabs over and fosters the deception of being successfully vaccinated. We might tell the Conference something of which they were now ignorant, but could learn nothing from them.

Dr. Rosenstirn, San Francisco Board of Health, thought that if Dr. Perry had spoken in favor of sending a delegate instead of against that proposition, he could not have spoken more favorably. The object of the Conference is for discussion of contagious diseases, and that we could give a deal of information upon this subject by attending is admitted by Dr. Perry in his remarks.

Dr. Simpson had only a word or two to say: Dr. Perry will admit that we have difficulties in regard to quarantine unknown to other States, and by letting them know our condition we would gain their support in all matters appertaining to the exclusion of disease. We ought, without doubt, be represented at that National Conference.

Dr. Orme agreed with Dr. Simpson, that we ought to have a representative there, and thought we ought to have two delegates at the Conference, as it was of vital importance to this State that our views be fully explained and the difficulties under which we labor in our isolated condition be fully set forth.

Dr. C. A. Ruggles thought there could be no doubt of the importance of this question, and was of the opinion that a delegate would by consultation gain more information than by any other means. The question for us to decide is, will the Governor consent to appropriate any diversion of this fund for this purpose? He was decidedly in favor of it, and thought that when explained to the Governor, there would be no difficulty in obtaining his consent, as it was to be used in the cause for which it was designed.

Dr. Barger, Health Officer of San Francisco, would like to ask, for information, the wording of the Act, which being recounted by the Secretary, Dr. Tyrrell, Dr. Barger said he could not see where the diversion spoken of by Dr. Ruggles came in, as he thought the Act contemplated we should use this money for the prevention of contagious disease, which is now what your Board designs to do.

The question being called for, a vote was taken, when the motion was carried unanimously.

Dr. Perry, of the San Francisco Board of Health, asked leave to introduce the following resolution:

Resolved, That a committee of two be appointed from the State Board of Health and from the San Francisco Board of Health to agree upon sanitary measures affecting both the State at large and the city of San Francisco, to be urged for passage before the next Legislature. This committee to report at a conference of both Boards.

Leave being granted, the resolutions were offered and carried unanimously.

The Secretary read a letter from the Health Officer of San Francisco, announcing the arrival of the steamer "Parthia," and her detention in quarantine, and informed our Board that her cabin passengers had escaped quarantine by leaving the steamer at Vancouver, British Columbia, and, being refused passage by sea via the Goodall, Perkins & Company's line of steamers, crossed the continent by the Northern Pacific Railroad.

The Secretary was instructed to take whatever steps he deemed necessary to protect California from this new inroad of infectious disease through the Oregon Railroad, and notify the officers of the company of the dangers which threatened their passenger traffic through this means. The communication was ordered on file.

A vote of thanks was passed to his Honor Mayor Pond and the San Francisco Board of Health, for their attendance and deliberations in the business of the Board.

Drs. Cole and Simpson were appointed the committee to consult with a like committee from the San Francisco Board of Health on legislative matters.

After quite an animated discussion upon the proper means of quarantining smallpox, indulged in by Dr. Ruggles, Dr. Simpson, Dr. Cole, and Dr. Bayer, on motion, the meeting adjourned.

GERRARD G. TYRRELL,
Secretary.

REPORT OF THE PERMANENT SECRETARY.

To the State Board of Health:

Gentlemen: In presenting this the tenth biennial report of the State Board of Health, your Secretary is glad to be able to congratulate the Board upon the advances it has made in the direction of inculcating the great principles of sanitary science in the public mind. So satisfied are we of the increase in the belief that the restriction or prevention of epidemic disease is not beyond the power of human intelligence, properly directed, that sanitary legislation in the coming session may be looked for with some degree of confidence in obtaining the passage of such laws as will make the sanitary government of this State equally as much a matter of vital necessity as the civil government itself.

Within the past two years nearly all the States in this Union have established State Boards of Health, and with these this Board is in close communion. Through the conference of these Boards we have adopted certain regulations whereby we each notify the other of the appearance of any epidemic, contagious, or infectious diseases, thus putting each State upon its guard to watch the progress of communicable affections, and take such precautionary measures that upon the very threshold of their march we can, by sanitary vigilance, stop them. Through the circulars and publications of your Board, an interest has been awakened in the public mind regarding the prevention of disease and the wonderful possibilities that lie in sanitary precaution and reform, which in no other way could be brought so directly under its notice. We find its fruits in the desire to establish local Boards of Health; in the abandonment of polluted water supplies; in the sewering of towns hitherto without drainage; in the destruction of garbage by burial or by fire; in the building of school houses properly warmed and ventilated; in the teaching of hygiene in schools and colleges, and in the general belief now dawning upon the public mind that cleanliness is next to godliness, and that disease and death follow closely in the wake of debauchery and dirt.

An efficient co-worker with our Board has been the press, and to its most powerful aid may be ascribed the dissemination of sanitary truths within our borders, and by its great influence we have been enabled to procure some legislation of incalculable value to the welfare of California. Our correspondents have with almost unfailing regularity transmitted their monthly records, whereby we were enabled to give a tolerably fair estimate of the general healthfulness of the State during the past two years. The mortality statistics, we regret to say, are not by any means complete, neither can they possibly be under the present law relating to births, marriages, and deaths. The cities and towns reporting deaths as a general rule report only those deaths within their limits, a few including those in the immediate vicinity.

Many deaths occur within a short distance, and are seldom reported, and very many more occur throughout the State of which this office hears nothing. This is a condition of affairs that should not be permitted to exist in any State or community professing to be in the van of civilization. Correct vital statistics are as necessary to the well being of a State as they are to a community. By them we can form some idea of sickness and mortality, with reference to the causes, and the comparative prevalence in localities, as well as the death rate. Again they afford a reliable record of certain events, which are often essential to be proved in establishing the right to property or its distribution, and not infrequently are they a reliable aid in the detection of crime. Within but a short time we have had the mortification of confessing to applicants for information relative to deceased persons the inability of our office to furnish the requisite legal knowledge required, no records being kept by the County Recorders, as required by law, no data being furnished them by physicians or others. This can only be rectified by making the recording of deaths compulsory, under a heavy fine or imprisonment; otherwise the law will be as now, completely ignored.

LEGISLATION.

An attempt was made before the Legislature of 1884 to have the law so changed that a correct registration might be possible. It was unfortunately never brought to a test vote. Accordingly, at the session of 1886, the following bill was introduced by Senator Briceland, and known as Senate Bill No. 113, with a view to amending the Political Code relative to the registry of births, marriages, and deaths:

AN ACT

To amend sections three thousand and seventy-seven, three thousand and seventy-eight, three thousand and eighty, and three thousand and eighty-two of an Act entitled "An Act to establish a Political Code," approved March twelfth, eighteen hundred and seventy-two, relative to the registry of births, deaths, and marriages.

The People of the State of California, represented in Senate and Assembly, do enact as follows:

SECTION 1. Section three thousand and seventy-seven of said Act to establish a Political Code is amended so as to read as follows:

Section 3077. All persons registering marriages, births, or deaths, must, at the close of every calendar month, file with the County Recorder a certified copy of their register. Each certificate must certify, as nearly as may be ascertained, the name in full, age, occupation, term of residence, in the city or county, birthplace, condition, whether single or married, widow or widower, sex, race, color, last place of residence, and also, when of accidents, the cause of death; and, also, when of births, the sex and color of the child, and name and nativity of its parents. Each person filing such copy is entitled to a compensation of twenty-five cents for each birth, marriage, or death so recorded, and the Recorder must give a certificate of such filing to the person entitled thereto, stating the number of deaths, marriages, or births recorded, and the amount due therefor. Upon the presentation of the Recorder's certificate to the County Auditor, he must deliver, at once, without any order of the Board of Supervisors, a warrant for the sum due, payable out of the General Fund of the County Treasury, and the County Treasurer is directed to pay the same. The Auditor must report the amount of warrants so drawn each month to the Board of Supervisors.

SEC. 2. Section three thousand and seventy-eight of said Act entitled an Act to establish a Political Code is amended so as to read as follows:

Section 3078. If, at any birth, there is no attending physician or midwife, the parents must make the report, and are entitled to the same compensation prescribed in the preceding section.

SEC. 3. Section three thousand and eighty of said Act to establish a Political Code is amended so as to read as follows:

Section 3080. The County Recorder, at the close of each month, must transmit to the Secretary of the State Board of Health, at Sacramento City, a certified abstract of the register of births, marriages, and deaths, prepared in the manner prescribed by the Secretary, and upon blanks furnished by him.

SEC. 4. Section three thousand and eighty-two of the Act to establish a Political Code is amended so as to read as follows:

Section 3082. Any person on whom a duty is imposed by this chapter, who fails, neglects, or refuses to perform the same, is liable to a penalty of fifty dollars and costs of suit for each offense, to be recovered in an action by the District Attorney of the proper county; one half of the penalty to be retained by him for his services, and the remainder to be paid into the General Fund of the county. The Secretary of the State Board of Health and the County Recorder must inform the District Attorney of any neglect of duty as prescribed in this chapter.

SEC. 5. This Act takes effect thirty days after its passage.

The bill was referred to the Committee on Hospitals, reported back with a recommendation for passage, and reached its second reading. Further than this it never got, although Dr. Briceland did his best to get this bill called up and passed. The passage of this bill would have required the registration of births, marriages, and deaths every month, and the compensation of those registering. It had also the good feature of throwing the onus of prosecution upon the State Board of Health in case of failure or neglect to register, and compelling the District Attorney to enter suit against the delinquent.

At the time this bill was introduced Senator Briceland also introduced Senate Bill No. 114, which read as follows:

AN ACT

To amend section three hundred and seventy-eight of an Act entitled an Act to establish a Penal Code, approved February fourteenth, eighteen hundred and seventy-two, relating to the preservation of the public health and safety and registration of births, deaths, and marriages.

The People of the State of California, represented in Senate and Assembly, do enact as follows:

SECTION 1. Section three hundred and seventy-eight of the Act entitled an Act to establish a Penal Code, approved February fourteenth, eighteen hundred and seventy-two, is amended so as to read as follows:

Section 378. Every person charged with the performance of any duty under the law relating to the public health, and every person charged with the duty of keeping a register of births, marriages, or deaths, and every Recorder, or other person, whose duty it is to report to the State Board of Health, who willfully neglects, or refuses to perform the same, and every person who willfully refuses to obey the rules and regulations passed by any Board of Health, or health officer having the powers of a Board of Health, is guilty of a misdemeanor.

This Act if it had passed would have brought the registration of births, marriages, and deaths under the operation of the Penal Code, and consequently increased our powers of compelling the observance of the law. It reached a second reading, but no further, as it was impossible to convince enough of the Senators that such a bill would have added to the welfare of the State or their own glory.

It was evident that no bill affecting the registration of births, marriages, and deaths could obtain passage among such a body of men, as they had no idea that such a subject was of any importance, or worthy of their serious consideration, or, as one intelligent Senator said, "Oh, confound it, when a man is dead, what is the use of bothering any more about him; who cares what becomes of him or whether he is registered or not?" This is a specimen of the mentality our Board had to contend with in its efforts to serve the State and improve its health laws.

It was now thought that a registry of deaths might be obtained if we could succeed in passing a law requiring the issuance of a permit before the burial or cremation of any human body could take place. Accordingly, Senate Bill No. 111 was prepared and introduced by Senator Briceland, as follows:

AN ACT

To amend section three thousand and eighty-four of an Act entitled "An Act to establish a Political Code," approved March twelfth, eighteen hundred and seventy-two, relative to the interment or cremation of human bodies.

The People of the State of California, represented in Senate and Assembly, do enact as follows:

SECTION 1. Section three thousand and eighty-four of the Act to establish a Political Code, approved March twelfth, eighteen hundred and seventy-two, is hereby amended so as to read as follows:

Section 3084. No person shall inter, cremate, or otherwise dispose of any human body, in any city, county, or city and county, without having first obtained a permit. In incorporated cities, or counties, or cities and counties, the permit must be obtained from the person authorized to grant the same by any law, ordinance, or resolution passed for that purpose. But in the absence of such law, ordinance, or resolution, the permit must be obtained from either the Coroner, or Health Officer, Board of Health, or if the Coroner be absent, then from the Health Officer or Board of Health; and if there be no Board of Health or Health Officer, then from a Justice of the Peace. The person applying for a permit must produce and file with the officer issuing the permit a certificate signed by a physician, or a Coroner, or two reputable citizens, setting forth as near as possible the name, age, color, place of birth, occupation, date, locality, and cause of death of deceased. And no permit shall be granted without the production of such certificate. Such permit must be filed with the County Recorder, and the person so filing is entitled to the compensation provided for in section three thousand and seventy-seven of this Code, but if any other registration of the death of the decedent shall have been made, the Recorder must record the name but once.

Sec. 2. This Act takes effect thirty days after its passage.

This, like the other bills, was referred to the Committee on Hospitals, and recommended for passage.

It reached its second reading, but was opposed from going further upon the grounds that it was putting the citizen to unnecessary trouble, and that in outside districts it might not be within the power of the friends to get such a permit, and that no right could exist to abridge the liberty of the citizen in burying his dead when he pleased. According to this kind of reasoning the bill was not given a third reading, and was buried without further ceremony.

Under the present law, as you are aware, relating to the registration of deaths, births, and marriages, it is defined who are to keep registers, and for their neglect to do so are liable, upon action of the District Attorney, to a fine of $50; but as no person ever heard of a prosecution by any District Attorney within the State, the law was disregarded and wholly inoperative. To take this matter into the Penal Code, where punishment might be meted out to offenders, Senator Briceland introduced Senate Bill No. 110, as follows:

An Act

To amend section three hundred and seventy-seven of an Act entitled an Act to establish a Penal Code, approved February fourteenth, eighteen hundred and seventy-two, relating to the disposal of human dead bodies, and preservation of the public health.

Section 1. Section three hundred and seventy-seven of an Act entitled "An Act to establish a Penal Code," approved February fourteenth, eighteen hundred and seventy-two, is amended so as to read as follows:

Section 377. Every person who is charged with a duty relating to the registration of deaths under Chapter III, Title VII, of the Act to establish a Political Code, approved March twelfth, eighteen hundred and seventy-two, who—

1. Willfully fails to keep a registry of the name, age, residence, and time of death, of a decedent; or,
2. Willfully fails to register with the County Recorder a certified copy of such register, as is provided for in said chapter; or,
3. Willfully inters, cremates, or otherwise disposes of any human body, in any city, county, or city and country, without having first obtained a permit, as provided for in said chapter; or,
4. Willfully grants a permit for the interment, cremation, or disposition of a dead human body, without the certificate provided for in said chapter; or,
5. Willfully violates any of the laws of this State relating to the preservation of the public health;

Is guilty of a misdemeanor, and is, unless a different punishment for such violation is prescribed by this Code, punishable by imprisonment in the county jail not exceeding one year, or by fine not exceeding one thousand dollars, or by both such fine and imprisonment.

This bill was referred to the Committee on Hospitals and recommended for passage; it reached a first reading, was placed on the file, and there it remained beyond resurrection. We now endeavored to improve the laws relating to

LOCAL BOARDS OF HEALTH.

The State Board of Health, among other duties, is required to place itself in communication with local Boards of Health. In order to do that Section 3061 of the Political Code says: "It shall be the duty of the Board of Trustees, Council, or other corresponding Board of every incorporated town and city of this State, to establish by ordinance a Board of Health for such town or city to consist of five persons," etc. This law, we regret to say, has not been obeyed in the manner contemplated by its originator, only twenty-six incorporated towns having local Boards of Health out of the sixty-three that should have them. As the establishment of local Boards of Health in every town is of the utmost importance as a district sanitary authority to which the people could look for protection from, and the preventive management of, dangerous contagious diseases, we endeavored to make the law mandatory, so that in each unincorporated town of five hundred or more inhabitants there must be appointed at least a Health Officer, who should have all the power of a Board of Health, and that in incorporated cities where the City Trustees, or other officers, failed to organize a Board of Health, the power should be delegated to the State Board to have such Board organized according to law. The object of the new law was to get the whole State under complete sanitary organization, so that our Board would have a network of communication through which we could keep thoroughly apprised of the condition of the public health and be enabled to take such means to prevent the spread of epidemics, that contagious diseases could make no headway. With this in view the following bill, No. 112, was introduced in the Senate:

AN ACT

To amend section three thousand and sixty-two of, and to add a new section to, an Act entitled "An Act to establish a Political Code," approved March twelfth, eighteen hundred and seventy-two, relating to Boards of Health.

The People of the State of California, represented in Senate and Assembly, do enact as follows:

SECTION 1. Section three thousand and sixty-two of said Act to establish a Political Code is amended so as to read as follows:

3062. The Board of Supervisors of each county must appoint, in each unincorporated city or town of five hundred or more inhabitants, a Health Officer, who has all the duties and powers of the Board of Health and Health Officer, as specified in this and the two preceding articles.

SEC. 2. There is added to said Code a new section, to be called section three thousand and sixty-four, which shall read as follows:

Section 3064. The Board of Supervisors must fix the salary or compensation of Boards of Health or Health Officer, and provide for the expenses of enforcing the provisions of this article. If the Board of Supervisors or Board of Trustees, Council, or other corresponding Board of any incorporated town neglects to provide a Board of Health or Health Officer by the first day of July, eighteen hundred and eighty-seven, the State Board of Health may direct the District Attorney of the county to begin an action against such Board of Supervisors, or Board of Trustees, or corresponding Board, to compel the performance of their duty, or may appoint a Board of Health or Health Officer, with the powers of a Board of Health, for such town or city, and the expenses of such Board of Health or Health Officer shall be a charge against the incorporated city or town for which such appointment shall be made, and when the appointment is made for unincorporated towns the expenses of the Board of Health or Health Officer is a charge against the county.

This bill was referred to the Committee on Hospitals and reported favorably, was placed on file and reached its second reading, thence it fell into "innocuous desuetude," and never was heard of more during the session. From our utter failure to amend the law relating to Boards of Health, our State is in a very precarious position should any severe epidemic disease become general, as we are without proper organization or the necessary discipline to enter into a combat with such a foe. At the coming session of the Legislature our co-member and Senator proposes to make another attempt to get this or a similar bill before the Senate, so that order may be restored from chaos.

VACCINATION.

In times of immunity from epidemics of smallpox the practice of vaccination is neglected, hence in a few years there is accumulated in the State a vast array of unvaccinated persons who fall ready victims to the malady when it reappears from any cause. To endeavor to make the practice general and protect us from the ravages of smallpox, we had the following Act introduced into the Senate by our fellow member, Dr. Briceland:

AN ACT

To encourage and provide for a general vaccination in the State of California.

The People of the State of California, represented in Senate and Assembly, do enact as follows:

SECTION 1. The Trustees of the several common school districts in this State, and Boards of common school government in the several cities and towns, are directed to exclude from the benefits of the common schools therein any child or any person who has not been vaccinated, until such time when said child or person shall be successfully vaccinated.

SEC. 2. The Trustees, or local Boards, annually, or at such special times to be stated by the State Board of Health, must give at least ten days' notice, by posting a notice in two or more public or conspicuous places within their jurisdiction, that provision has been made for the vaccination of any child of suitable age who may desire to attend the common schools, and whose parents or guardians are pecuniarily or otherwise unable to procure vaccination for such child.

SEC. 3. The said Trustees or Board must immediately after the passage of this Act, and every year thereafter, appoint some competent physician and fix the compensation for his services, the duty of which physician shall be to ascertain the number of children or persons in the school district, or subdivision of city school government, being of age suitable to attend the common school, who have not been already vaccinated, and also to furnish to the said Trustees or said Board a list of the names of all such children or persons. It shall also be the duty of said physician to provide himself with good and reliable vaccine virus wherewith to vaccinate such of the number of children or persons aforesaid as have not been vaccinated according as the Trustees or Board shall direct, and to thereupon give certificates of vaccination when said physician has, by personal examination, assured himself of the success of the vaccination, which certificates shall be evidence thereof for the purpose of a compliance with section first hereof.

SEC. 4. The necessary expenses incurred by the provisions of this Act shall be paid out of the common school moneys apportioned to the district, city, or town, and if there be not sufficient money, the Trustees must notify the Board of Supervisors of the amount of money necessary, and the Board must, at the time of levying the county tax, levy a tax upon the taxable property in the district sufficient to raise the amount needed. The rate of taxation is ascertained by deducting fifteen per cent for delinquencies from the assessment, and the rate must be based upon the remainder. The tax so levied shall be computed and entered upon the assessment roll by the County Auditor, and collected at the same time and in the same manner as State and county taxes, and when collected shall be paid into the County Treasury for the use of the district.

SEC. 5. The Trustees of the several school districts of this State are hereby required to include in their annual report, and report to the Secretary of the State Board of Health, the number in their several districts between the ages of five and twenty-one years who are vaccinated, and the number unvaccinated.

SEC. 6. This Act shall take effect immediately.

We had hoped by the passage of this bill to insure the vaccination of the rising generation, and by making it general in its application, that no opposition would arise to defeat it. It was referred to the Committee on Hospitals, and reported back favorably, with a recommendation for passage. It was read a first and second time, and placed on file. When it was called a third time for passage, one of the learned Senators from San Francisco, of whom we were taught to expect better things, moved that "the enacting clause be stricken out," as he afterwards said, "he was not going to have any man's child kept out of school because it was not vaccinated." As this man was a political wirepuller, with great influence in his delegation, the enacting clause was stricken out, and the bill was then and there effectually strangled. This has been the history of our attempts at improving the health laws of California, of our desire to have enacted such measures as would add to the safety and welfare of the people. Upon every occasion we were ignominiously defeated, through the ignorance or design of those who were elected by the people to serve their interests. Happily, at this time, smallpox was imported into the State from Mexico. It soon began to inspire fear of its extension among the constituents of our Senators and Assemblymen, and, like the sinners of old, they cried, "What shall we do to be saved?" Smallpox was epidemic in Mexico; it had crossed our border and was now traveling north. Your Board had no funds with which to take any preventive measures, and your Governor had no means at his command. In this emergency, although irritated by former incomprehensible defeats, Senator Briceland introduced into the Senate the following bill (No. 431):

AN ACT

To appropriate money to prevent the introduction of contagious and infectious diseases.

The People of the State of California, represented in Senate and Assembly, do enact as follows:

SECTION 1. The sum of twenty thousand dollars is hereby appropriated out of the General Fund in the State Treasury, to be expended by the State Board of Health, under the direction of the Governor, for the prevention of the introduction of contagious and infectious diseases into the State. The claims for such expenditures must be audited by the Board of Examiners; except that when a contingency arises, which, in the opinion of the Governor, demands the immediate use of money, the Controller may draw his warrant upon the order of the Governor in such sums, not exceeding one thousand dollars, as he may direct in the name of the State Board of Health; *provided*, that an account must thereafter be filed with the Board of Examiners and audited by it and transmitted to the Controller showing the manner of such expenditure.

SEC. 2. This Act takes effect immediately.

This bill seemed to meet with approval, but could not be permitted to be passed without some amendment or other; accordingly, Senator Clunie amended it by inserting $10,000 instead of $20,000, to be appropriated for sanitary purposes, and in this shape the bill passed and was signed by the Governor.

The session was now about closed, and no further attempt could be made to increase the usefulness of the State Board of Health. To be sure, we did make an attempt to get $5,000 for two years for the State Analyst, to enable him to employ an assistant or two, so that we could have the mineral waters of the State analyzed, but the Committee on Appropriations would not consent to place it in the bill, and as a consequence the mineral waters remain unanalyzed, except in those cases undertaken by private enterprise.

The history of legislation for the session of 1886 may be set down as a failure. No law was passed to amend our health laws, and the only substantial gain made was the appropriation of a small sum for emergencies, should such arise. We must reluctantly confess that this speaks very badly for the intelligence of those chosen by the people to make their laws. Where legislation is to be had to preserve hogs from cholera, horses from glanders, cattle from plague, or trees from insects, there is no trouble in getting a respectful hearing of the bill and its speedy passage. But when the State Board of Health, true to its mission of mercy, seeks to amend the laws appertaining to health, so as to prevent the ravages of disease, to prolong by wise sanitary measures the period of existence allotted to man, to preserve human life by the lessening of the opportunities for crime, to prevent the advent of disease by timely measures of precaution and sanitary watchfulness, we are met with the most supreme indifference, or perhaps asked, "How much is there in the bill?" No consideration of the important results involved, no thought of the interest of the State of California in the preservation of its people, or in the establishing of its claim as the world's sanitarium; on the contrary every effort made to improve our sanitary laws has been looked upon as some attempt upon the part of the "doctors" to obtain some special legislation for their own benefit or aggrandizement, which can be illustrated by the remark of a legislator to the writer, when he said: "Doctor, where is the nigger in that fence? I want a look at him."

Since that time two years have elapsed, during which period your Board, through its Secretary, has published monthly, without a single exception, a circular giving a report of all the deaths received from his private correspondents, the causes, as far as known, and the ages of the decedents; besides this, a list of all the prevailing diseases of each county has been summarized, and deductions drawn therefrom concerning the sanitary condition of the State; in addition, your Secretary thought it prudent each month to introduce some few hints as to sanitation and its necessity. By this means the public has been kept informed of the course of disease, where prevalent, and how to avoid it; it has also been taught that the State has provided a guardian over its vital interests in the form of your Board; it has also learned, we hope, that the welfare of the people, their preservation from disease and death, is its whole object and desire; it has also learned that the power of the State Board of Health is restricted—it has no mandatory power—and in its present helpless condition can only advise.

What we ask from the Legislature is more power to act in the interest of California; when our Board is asked to check an epidemic, we want the power to do it; when a town or city refuses to restrain its people from communicating its infectious disease to its innocent neighbors, we want to be able to compel such town or city to keep its disease at home, and there destroy it; if a county will not establish a Board of Health or a Health Officer, we must have compulsory power to establish such Board, as by such Boards unification of purpose is established, and a cordon of faithful guardsmen of the public weal organized, so that disease cannot spread and human life be thus imperiled.

We sincerely trust that the efforts made by the Board may be so productive of good that our Legislature will see that what we ask has "no nigger in the fence," but is solely and wholly in the interest of the people of California. We have within this State the possibilities of a perfect sanitarium, an embodiment of all that constitutes the perfection of a hygienic home. If we destroy it by neglect, or impair its perfections by sanitary delay, we are alone to blame. Nature has given us climate, soil, and water in perfection; it is our duty to preserve their purity.

QUARANTINE.

The subject of coast quarantine had engaged the attention of your Board for many years, and as you are aware our efforts failed of success. In the early part of 1886, your Board determined to make another effort, as we were continually threatened by an invasion of smallpox, cholera, and yellow fever, by way of China, Mexico, the Sandwich Islands, and Japan. Accordingly the following bill was prepared and forwarded to our Representatives in Washington:

AN ACT

To establish a Quarantine Station at the Port of San Francisco.

Be it enacted by the Senate and House of Representatives of the United States of America, in Congress assembled:

THAT, WHEREAS, The Port of San Francisco is peculiarly liable to the incursions of infectious and contagious diseases from South America, Pacific Islands, and Asiatic ports, and it is desirable to establish a well appointed quarantine station thereat;

Now, Therefore, There is hereby appropriated out of any money in the Treasury not otherwise appropriated, such sum, not exceeding one hundred thousand dollars, as may be necessary to purchase grounds and erect buildings suitable for quarantine purposes at the port of San Francisco. The same shall be forthwith expended, for the purpose aforesaid, under the direction of the Secretary of the Treasury.

The said quarantine grounds and buildings, when completed, shall be under the supervision of the Marine Hospital service at said port. The use thereof, from time to time, may be granted by the authorities of said Hospital to the Health Departments of the City and County of San Francisco or State of California, upon condition that the said Health Departments, or either of them, assume the expense of maintaining the same.

This bill met with the approval of Senator Leland Stanford, who introduced it and watched its progress through the committee and had it favorably reported. In the meantime your Board had printed sufficient copies of the bill to supply the members of both houses, which were immediately forwarded, one copy to each member, accompanied by the following letter:

California State Board of Health,
Sacramento, January 23, 1888.

Hon. —— ——, Washington, D. C.:

Dear Sir: At a meeting of the State Board of Health of California, held January fifth, it was unanimously resolved to ask all of our Senators and Representatives in Congress to urge to immediate passage the "Act to establish a quarantine station at San Francisco."

Said bill has already been introduced in the Senate by Senator Stanford, and we now inclose you a copy of the same, and hope, as you are familiar with our necessities at this time, when smallpox has already been introduced into our State from China, and that we will probably be obliged to quarantine against cholera before many months, that you will give this matter the immediate attention which its importance demands.

This bill has the indorsement of the Board of Trade and Commerce in San Francisco, and has been urged and demanded by our State Board of Health since 1880.

I remain, dear sir, yours, respectfully,

GERRARD GEO. TYRRELL,
Secretary.

To this appeal many very favorable responses were returned, and the Senate passed the bill. When it reached the House, Congressmen W. W. Morrow and C. N. Felton took charge, and by persistent and patient efforts, with the aid of their colleagues, had the bill passed, amended so as to include San Diego. This bill was signed by the President, and now we have the satisfaction of knowing that very soon we will have a quarantine station and quarantine buildings, both in the port of San Diego, as well as in the port of San Francisco. For this boon the State Board of Health may claim no small share, as it has worked persistently, in the face of almost insurmountable obstacles, until the object sought was obtained.

Another source of gratification to this Board is a letter received from Dr. Joseph Holt, the distinguished sanitarian of New Orleans, in which he states that General J. B. Hamilton has assured him that his plan known as the "Holt Plan," or "New Orleans Plan," will substantially be adopted in all the new quarantine stations to be hereafter established. As this plan has been adopted in the Dominion of Canada, from its proven success in New Orleans, your Secretary deemed it of sufficient interest to obtain the permission of Dr. Holt to republish his descriptive history of the practical operations involved in the carrying out of his ideas. Dr. Holt not only gave his cheerful consent, but supplied our Board with the original plates to illustrate the paper, and which your Board will find duly reprinted in this report. The organization of quarantine buildings, supplied with Dr. Holt's apparatus, will practically relieve us of the constant dread of infectious disease reaching our shores by sea. We still have to contend with the positive danger that constantly threatens us inland.

In the early part of the year 1887 smallpox was very prevalent throughout Mexico, and especially along the border towns in communication with our State. As no precautionary or sanitary measures are observed among the Mexicans in the frontier settlements, the advent of any of them into our State is liable to introduce the germs of the disease, and this is just what did happen in February, 1887, when some Mexicans from over the border attended an entertainment in Los Angeles. In a few days afterwards smallpox developed in that city, a detailed account of which will be found in a paper by your President in another part of the report. Inland quarantine against smallpox was at once instituted by your Board, and Inspectors placed on all trains entering the State and on all vessels arriving by sea from Mexico. We were enabled to do this from the fact that a fund had been provided for such purpose, without which your Board would have been perfectly powerless. Through the vigilance used by our Inspectors not a single case of smallpox was permitted to gain entrance by land, and by the timely efforts of your Board, the disease was quickly subdued by the local authorities in the city where it started.

If our Legislature in its wisdom will continue in force the Contingent Contagious Disease Fund, and increase its amount to at least the original sum asked, we will be enabled to watch our borders more closely, which even now is absolutely necessary, as the increase of travel into this State is acquiring such proportions that our danger of infection from abroad is much increased, and daily increasing. If it should become necessary to establish temporary buildings on the border to disinfect and fumigate goods and passengers arriving from smallpox, cholera, or yellow fever stricken districts, it is beyond question necessary that a sufficient fund be set aside to be used for that purpose. The pittance now in the hands of the Governor, or rather at his disposal, would not begin to place an effective quarantine against yellow fever, which at the present time is epidemic in Florida. To efficiently guard our State against this most dreaded of all diseases, the quarantine must be rigid. We must be prepared to stop all passengers and goods coming from affected districts. We must have means to temporarily lodge the passengers for a period of ten days, and also the means of fumigating and disinfecting both their persons and their goods. To do this we must have temporary structures erected some distance away from the line of travel, with all the appliances necessary to make travelers comfortable during their time of detention. We must have also a temporary hospital for the retention of any that are sick. All this involves a considerable outlay, and will no doubt meet with much opposition from those who do not realize what an epidemic of cholera or yellow fever would cost this State. Better far that any amount of money be expended to preserve us from such a calamity, that would not only kill our inhabitants, but also effectually kill our State as a sanitarium, and take from us our boast that California is the most desirable place of residence in the known world.

There is no necessity to further enlarge upon this need. We must have a contingent fund, under the control of the Governor, for immediate use whenever needed, and it is to be hoped that the incoming Legislature will have sufficient sagacity to recognize the importance of this measure, and have wisdom and forethought enough to make the appropriation so large that preventive measures can at any time be taken, so as to insure our State against the invasion of disease, if it is within the power of intelligent humanity to do it.

Since the publication of our last biennial report, your Secretary has the pleasure of recording that our State has been particularly free from epidemic disease, with the exception of an inroad of smallpox, which never attained to any serious dimensions.

SMALLPOX

First appeared in Los Angeles February 16, 1887. On the nineteenth, ten cases had developed, which were all removed to the smallpox hospital, or carefully isolated at their homes. It was ascertained that all these cases occurring in young men had a common exposure in a variety theater much frequented by Mexicans, and as smallpox was prevalent in Mexico at the time, the presumption was strong that the infection was carried by the clothing of the Mexicans into the closely packed theater, there to produce these results. On the twenty-seventh of February the disease had spread to Lugo settlement, nine miles from Los Angeles, and from day to day reports were received of cases of smallpox here and there throughout the county. A degree of alarm having thus been incited, the State Board of Health deemed it its duty to take some active steps to prevent, if possible, the extension of the disease beyond its present boundaries. Accordingly a special meeting of the Board was held on March 8, 1887, for the purpose of taking into consideration the propriety of quarantining the southern border of the State. We had information that the disease was very prevalent in Sonora, Guaymas, and Mazatlan, in Mexico, all towns in close relation with our State. It was by this time quite prevalent in Los Angeles, and some cases were reported in San Diego County. After due consideration, the Board instructed your Secretary to confer with the railroad authorities, and make such arrangements that a quarantine might be developed at any time the Board deemed necessary. As you are aware, our mission was successful, and resulted in our placing Medical Inspectors at all the points where smallpox would be likely to invade the northern portion of the State. By this means smallpox was confined to the lower counties, and by the first of May we were able to discontinue their services, and by June, 1887, the disease was wholly under control.

In February, 1887, a single case of smallpox appeared in San Francisco. Its origin was not traced. The city remained free from the disease until May third, when a Chinese passenger on the steamer "City of Sydney," from Hongkong, introduced it eight days after deportation from the steamer. In the report kindly furnished by Dr. S. S. Herrick, of San Francisco, a detailed statement is made of the progress of the disease in that city, whereby it will be seen that at no time did it actually develop into a serious epidemic. In the early part of the year your Secretary was instructed to issue a circular calling attention to the necessity of vaccination, together with the means to be used to prevent the spread of the disease. Accordingly twenty thousand copies of the following circular were printed and distributed throughout the State:

FACTS FOR THE PEOPLE CONCERNING SMALLPOX AND VACCINATION.

Smallpox.

After an absence of many years, smallpox has again been imported into our State. The extreme liability of its diffusion through railway intercommunication, and personal contagion, and in view of checking its progress, the State Board of Health feels it its imperative duty to present certain suggestions and precautions, the compliance with which will restore confidence to those who suffer from fear of the disease, and absolute immunity to those in danger of contagion. There are two ways to obtain protection from smallpox. One is by strict quarantine, to completely shut it out, and the other is to anticipate it by a general vaccination. As the first mode is more or less liable to failure, through lack of vigilance on the part of the authorities, or absence of indications of the incubating disease that would warrant detention, it is the more certain plan to vaccinate as well as quarantine, and then we have the disease wholly under command as nearly as human means can do it.

Preventive Measures.

Vaccination is the only preventive measure that is known to successfully avert smallpox. If properly done with reliable virus, whether bovine or humanized, there is nothing more absolutely certain than the fact of the protection of the individual from the fatal effects of smallpox.

The vaccination ought, if possible, to be performed by an educated physician, with lymph that *he knows* to be pure and reliable, and who is perfectly familiar with the typical vesicle produced; or, in other words, who knows that the vaccination has been successful, or *taken* properly.

There are, however, certain precautions to be taken in the performance of the operation of vaccination, to make the result certain. The State Board of Health cannot too earnestly protest against the careless and unscientific manner in which it is too often performed and the result ascertained. In many, very many, such cases vaccination serves only to deceive, through a false sense of security; much unmerited disparagement is cast upon the value of the operation, and the confidence which its preventive power inspired is rudely shaken when the *supposed to be* vaccinated person is stricken with smallpox. This result is to be doubly deplored; first, on the part of the stricken victim, and again for the fruitful theme for controversy which it suggests to the opponents of vaccination, and which it is often very difficult to combat. To avoid, as much as possible, any such contingency, and to insure the result of a perfect vaccination, the following recommendations are presented for adoption to all vaccinators, as designed to secure and maintain the public confidence in the protective power of vaccination, which is beyond serious question:

First—Except as far as the immediate danger of smallpox may require, vaccinate only subjects that are in good health.

In case of infants, ascertain that there is not any febrile state, any irritation of the bowels, or unhealthy condition of the skin.

Do not vaccinate, except in cases of great necessity, where there has been recent exposure to the infection of measles, scarlet fever, or diphtheria, or where erysipelas has been prevailing in or about the place of residence.

Second—In all ordinary cases of primary vaccination make such insertions of vaccine virus as will produce at least two or more separate good sized vesicles, which should be carefully protected from injury during their progress toward maturation, avoiding afterward the premature removal of the crust. Do not use any needless dressing to a vaccinated arm; a simple strip of clean, soft muslin, carefully sewed round the arm, will protect it from abrasion.

Third—The virus used should be of known purity, whether in the form of humanized or bovine lymph. The crust or scab should never be used except in cases of necessity, and then only under the surveillance of the physician. Self-vaccination, or vaccination performed by unprofessional friends, unqualified to distinguish the true sore from that which is spurious, is often attended by serious results, and might be the means of introducing poisonous matter into the blood, which ought to be avoided, as death may be the consequence.

Fourth—Virus should *never* be used from the arms of revaccinated persons. There is no evidence that it possesses any protective power; but, on the contrary, may be injurious.

Human lymph should be taken only from subjects who are in good health, and of healthy parentage, preferring children whose families are known to you. Take the lymph from well marked, uninjured vesicles, when the vesicles are fully formed and plump. That is on the eighth day after primary vaccination, and before any conspicuous appearance of the red or inflammatory areola, which on the ninth day surrounds the vesicle. In opening the vesicles, which is done with a clean needle, be careful not to draw blood, and use no lymph or virus that is not perfectly clear and transparent when it exudes from the arm. If any blood should be drawn, wipe it carefully away before using the lymp, as on no account must blood be introduced with pure vaccine virus into the system of your patient. A most important point, upon which we strenuously insist, is that the vaccinating instrument, no matter what it is, is perfectly and undoubtedly clean; to be sure, wash it in fresh and pure water before using, and see that it is rewashed before using it on a second person. More serious and unfortunate accidents have occurred from carelessness in using unclean instruments than from any other cause known to this Board. If bovine virus is used, recollect that to insure its action the surface receiving it has to be well abraded and the lymph thoroughly rubbed in until the part is dry; neglect of this rule will result in many failures and bovine virus be unduly discredited.

Never use the scab for vaccinating purposes, except under the most exceptional circumstances; to its use may be attributed those cases of sore arms, poisoned blood, and unhealthy ulcers, which anti-vaccinators take such delight in quoting as their strongest argument against the precious gift of the immortal Jenner.

If the necessity arises that the scab must be used, see that it looks clean, is well umbilicated, and the edges semi-transparent. Do not use the center, but only the outer border of the crust. The portion to be used ought to be thoroughly softened in a drop or two of water, and then used in the same manner as lymph. It would be prudent to ascertain the condition of the child from whom the scab was taken before using it, and if not in perfect health, reject it. Caution cannot be too strictly observed when vaccinating from this source.

In smallpox there is always a period of latency, called the period of incubation, during which certain processes are going on preparatory to the development of the disease. This period may be stated to be about ten to twelve days for the beginning of the fever, and fourteen days for that of the eruption. In the vaccine disease the virus begins to *take* on the fourth day, and with bovine virus on the fifth or sixth day, and such is the protective power of the vaccine virus that if it be inserted even after exposure to smallpox its shorter incubative stage enables it to anticipate the other, and if it do not altogether prevent it, it induces such a deviation from its regular course as to essentially modify it and deprive it of its greatest danger. Hence the importance of immediate vaccination after exposure to smallpox.

Every infant should be vaccinated within three or four months after its birth.

Every child should be revaccinated before its tenth year.

No child should be permitted to enter any school until it is successfully vaccinated, and so certified to by the operating physician.

Every adult should be revaccinated every seven years. It may not take, but it secures the safety of those who try it.

In the Presence of the Disease.

No time should be lost, but a general vaccination insisted upon. Fortunately it is our great privilege to live in California, the inhabitants of which are too intelligent and well informed not to see the importance of this measure when smallpox invades their town or city. Smallpox in a community means the paralyzing of all trade and commerce. It means pecuniary loss, sickness, suffering, destitution, deformity, or death. It means a condition of things that in a civilized community could and should be at once arrested. All employers must take the initiative, and have every man in their employ vaccinated as the condition upon which their employment is continued. All railroad men, police officers, and those connected with public offices, should especially be protected, as they are constantly exposed through the traveling public to the germs of the disease, which may be lurking in the wayfarers' clothes, or among their baggage. In short, it is the imperative duty of the local authorities to secure protection to all classes, that none remain unprotected, to the imminent danger of their fellow citizens.

Smallpox in the House.

When, unfortunately, this occurrence has taken place, at once notify the Health Officer or the health authorities, then have every member of the family vaccinated at once. Smallpox, as said before, takes ten to fourteen days after exposure before it becomes apparent. Vaccine takes only four to six days. If, therefore, you are immediately vaccinated after exposure you will anticipate the disease, and either avert it or so modify it as to render it comparatively harmless and mild.

The patient should be placed, if practicable, in the highest room in the house, and as distant from the apartments of the rest of the family as possible. Here he should have the most complete isolation and ventilation that can be attained. The room, before occupancy, should be stripped of all unnecessary furniture, carpets, curtains, woolen goods, and clothing, and the utmost cleanliness observed, both with regard to the patient and the room. Disinfectants may be constantly used; especially should a vessel containing chloride of lime be placed at the bedside for patients to spit into. The same should be used freely in the vessels required for the reception of excreta, which should be at once removed and buried. Lastly, a large tub containing a disinfectant solution should be kept in the room, into which all soiled clothes could at once be plunged and removed for further disinfection. Rags should be used to wipe away all secretions from the mouth or nose, and immediately burned. All glasses, cups, or other vessels used by the patient, must be scrupulously cleansed and washed in a disinfectant solution. No person should be admitted into the room but those waiting upon the patient; and a sheet wrung out of a strong disinfectant solution ought to be suspended outside the door of the patient's room.

Smallpox is in its most contagious condition when the scabs are matured, and no convalescent patient should be permitted to mingle with his family until all the scabs have fallen off and the skin quite clean.

In case of death, wrap the body in a sheet saturated with a strong solution of sulphate of zinc, and have it coffined and buried without any unnecessary delay, without any wake or public funeral.

Disinfectant Solutions.

As these solutions are within the means of every one, the State Board of Health thinks it well to familiarize the public with their composition:

Roll Sulphur (brimstone), for fumigation. This is a cheap and efficient substance for fumigating rooms; it is positively destructive to disease germs, when efficiently used.

Sulphate of Iron (copperas), dissolved in the proportion of one and a half pounds to the gallon of water, is a cheap and reliable deodorizer and antiseptic for privies, cesspools, sewers, etc.

Sulphate of Zinc, in the proportion of four ounces of sulphate and two ounces of common salt to the gallon of water, is efficient and harmless for clothing, bed linen, blankets, etc. It should be used boiling hot, and the articles to be disinfected plunged into it and thoroughly boiled.

Corrosive Sublimate, in the proportion of a quarter of an ounce to the gallon, is an unsurpassed germicide and disinfectant, but has the disadvantage of being excessively poisonous, and therefore dangerous for general use.

Carbolic Acid is of uncertain strength, is expensive, and experience has shown that it must be employed in comparatively large quantities to be of any use. It is also liable, by its strong odor, to give a false sense of security.

How to Use Disinfectants.

I. *In the Sick Room.* The most available agents are fresh air and cleanliness. The clothing, towels, bed linen, etc., should, on removal from the patient, be placed in a tub of the zinc solution, boiling hot if possible. All discharges from the patient should either be received in vessels containing the copperas or corrosive sublimate solution, or if this is impracticable, should be covered with the solution. Unnecessary furniture, especially that which is stuffed, carpets, and hangings should be removed from the room at the outset if possible; otherwise they should remain for fumigation and treatment.

II. *Fumigation* with sulphur is the only practical method of disinfecting the house. For this purpose the rooms to be disinfected *must be vacated.* Heavy clothing, blankets, bedding, and other articles which cannot be treated with the zinc solution, should be opened and exposed during fumigation, as directed below: Close the rooms as tightly as possible, stopping up every crevice and keyhole; place the sulphur in iron pans supported upon bricks placed in washtubs containing a little water; set it on fire with alcohol or kerosene sprinkled upon it, and allow the room to remain closed twenty-four hours. For a room ten feet square at least two pounds of sulphur will be required; for larger rooms proportionately larger quantities will be necessary.

III. *Premises*, cellars, yards, stables, gutters, privies, cesspools, water-closets, sewers, drains, should be liberally treated with the copperas solution; it is cheap and effective. The copperas solution may be easily prepared by hanging a basket containing about sixty pounds of copperas in a barrel of water.

IV. *Body and Bedclothing.* It is best to burn all articles which have been in contact with persons sick with infectious or contagious diseases. Articles too valuable to be destroyed should be treated as follows: *Cotton, linen, flannel, blankets,* etc., should be treated with the boiling hot zinc solution; introduce piece by piece; secure thorough wetting, and boil for half an hour. *Furs, silks, heavy woolen clothing, bedcovers, and beds,* which cannot be thus treated with the zinc solution, should be hung in the room during fumigation, their surfaces fully exposed, and their pockets turned inside out; afterwards they should be hung in the open air—beaten and shaken. Pillows, beds, stuffed mattresses, upholstered furniture, etc., should be cut open, the contents spread out and thoroughly fumigated. Carpets are best fumigated on the floor, but should afterwards be removed to the open air and thoroughly shaken and beaten.

Finally.

If, from neglect or delay in enforcing precautionary measures, the disease shows a tendency to become epidemic, the public and private schools must be closed, church services suspended, and public assemblages of people, as at theaters, shows, circuses, skating rinks, or other gatherings, be prohibited. Other towns or cities would be fully justified in maintaining a non-intercourse quarantine against any place neglecting to enforce the sanitary measures which all past experience has heretofore demonstrated to be effective in "stamping out" this most loathsome and contagious of all contagious disorders.

GERRARD G. TYRRELL,
Permanent Secretary State Board of Health.

By order of the Board.

H. S. ORME, M.D., President.

Copies of this circular can be had for free distribution upon application to the Secretary, Sacramento.

The effect of this circular was at once apparent. Vaccination became quite general, and the supply of bovine for a time scarce, the demand being so great.

In the "Monthly Circular" for February, the State was warned of the advent of smallpox, and the necessity of general vaccination insisted upon; but as this bulletin reaches comparatively few, except when republished by the press, the advice was not heeded to the same extent as that given in the "Smallpox Circular."

In June, 1887, three cases of smallpox were discovered in Irvington, a village in Alameda County. Isolation and quarantine were at once established, and no other cases developed there.

In August a case of varioloid appeared in Berkeley, which was at once conveyed to the Oakland Smallpox Hospital. No other cases were reported.

In September, one case appeared in Oakland, and one in Cloverdale. In October, a case was reported in Oakland. In November, two cases were reported near Suisun, one case in Elmira, and one in Oakland. The disease was making some progress through the State, but very slowly. In December, it was reported in Alameda, Solano, Marin, Sonoma, San Joaquin, Butte, Contra Costa, Nevada, Siskiyou, Lake, and Sierra Counties. The cases were small in number, but all as far as known traced their origin to San Francisco. In Sierra City the disease at one time assumed almost epidemic proportions. In response to a letter from us asking particulars of the outbreak in Sierra City, Dr. Tully replied that during the latter part of November, 1887, a saloon keeper named Joe ——, was taken sick and attended by a physician, who told him that "he had smallpox, but as it was a mild case there was no need of making any fuss about it." Consequently none was made, and visitors were freely admitted to his room and allowed to sit in the barroom before he was fully convalescent, and to mingle freely with the public. The second case was a waitress in the same hotel in which the saloon keeper worked, and had visited his room daily. She was confined to bed after a few days' premonitory illness, but no announcement of smallpox was yet made. The third case was a miner who lived in the hotel and was one of the visitors to the first patient. The fourth case was also a miner and boarder at the hotel. These cases, the first seen by Dr. Tully, were formally declared to be smallpox, and steps were taken to quarantine the patients. Dr. Jump, of Downieville, saw these patients and confirmed Dr. Tully's diagnosis. Thirty cases occurred in the town, twenty-eight of which were directly traceable to the *mild* case in the hotel. Five deaths resulted from the mistake in not taking the necessary precautions with the first case and having it perfectly quarantined, isolated, and disinfected. The disease spread to North Bloomfield, where two cases occurred with one death. It appeared also in Sierra Valley, Loyalton, and Satley. In January, 1888, a rigid quarantine was instituted, and the disease ceased to spread.

We find in the "Monthly Circular" that during the month of January cases were reported in different parts of the State: two hundred and twenty-four in San Francisco, ten in Los Angeles, eight in Stockton, eleven in San José, three in Dunsmuir, two in Red Bluff, two in Redding, two in Sacramento, two in Berkeley, eight in Martinez, three in Tulare, one in Delta, Castroville, Santa Rosa, Cloverdale, Santa Barbara, Yuba City, Riverside, and Chico. Of the two cases in Redding, Dr. Miller writes that one of them was contracted from a dog carrying the infection in his hair to the child, who lived a quarter of a mile from where the other patient was quarantined. It seemed, however, that this dog was constantly by the sick man's side, and went from there to visit the child, to whom he was much attached. The disease was therefore attributed very justly to the visits of this canine, and is a good illustration of the danger that arises from the presence of animals in the sick room. In February the disease began to show symptoms of abating. No new cases appeared in San Diego; in Los Angeles the disease was also lessened in numbers, likewise in San Francisco. In Oakland only seven cases were reported, and in San Francisco the number had fallen to one hundred and fifteen, of these eighteen were Chinamen, fifteen of them importing the disease directly from China.

Reports were received that the disease was spreading in the interior of the State, from want of proper appreciation of the necessity of isolation and quarantine. The following letter was received on the eighth day of March, 1888, from Calaveras County:

West Point, California, March 8, 1888.

G. G. Tyrrell, *M.D., Secretary State Board of Health:*

Dear Sir: A rather peculiar type of an eruptive disease has been infecting most all of the towns of this county, which, quite probably, has been reported to you before this; and I write you to know if this is the only locality of the State which has been subject to it. Being now at the time of the smallpox scare, of course these cases cause no little alarm. The cases in Mokelumne Hill and this vicinity seem to have originated from a case in Howe's Hotel, in San Andreas, where (and also at Murphys) they have had many other cases. I have a case here, in the midst of town, above one of the stores, which is a typical case, and which came directly from similar cases at Mokelumne Hill. Young man, about twenty-six or twenty-eight years old; taken down ten days ago; intense fever; temperature, 106½ degrees; headache; vomiting; fever ranged from 103 degrees to 106 degrees for about two days and a half, when a slight eruption appeared on his forehead—little red papules, like beginning of measles. Fever came down to 100 degrees, in two or three days. This eruption covered his entire body, with hardly a place to put a pin's head; it enlarged to the size of No. 3 shot on the face and neck; on the hands, arms, and legs the eruption was as large as buckshot, semi-ovoid. Yesterday and day before (eighth and ninth days) they were pustular, and although I had not seen him for four days, I judged they had been in that condition for two or three days. Last night (ninth day) his temperature was 103 degrees. These pustules itch very little, but he is in great misery from the heat and burning produced.

If not smallpox it is at least a most revolting and loathsome disease. He is swollen all over his body, face particularly, so that he has not seen out of his eyes for three or four days. They tell me that very few pits are left from the cases around San Andreas or Mokelumne Hill. This is my first in this village. I am told that on the falling off of the scabs slightly elevated spots are left, as a rule, although quite often pits are left where the pustules are scratched. There is no noticeable odor. Dr. Murphy, of San Andreas, claims all the cases in San Andreas are *chickenpox*. Dr. Kelly, of Murphys, and Dr. Thompson, of Mokelumne Hill, claim them to be smallpox. Whatever their cases are mine is, for it *originated* from theirs, although this case is the most severe of any one so far. If it is chickenpox, why is he now, at the ninth day, not improving, instead of being covered from head to foot with five thousand vesicles, of a dirty yellow color, from the size of a No. 3 shot to buckshot, with temperature at 103 degrees?

If it is chickenpox, why were the premonitory symptoms so severe for three days, with temperature at from 104 degrees to 106½ degrees before the eruption? The eruption is (if any difference) more marked on the face.

If it is chickenpox, is it not strange to have the vesicles of such a large size and in such large number?

If it is smallpox, there has been no fatal case, excepting a Mrs. Benson, of San Andreas, who had a premature labor at the same time.

If it is neither chickenpox nor smallpox, what is it? It certainly is contagious, and a disease that is at least undesirable in a community.

Very truly yours,

AUSTIN C. WRIGHT, M.D.

Upon receipt of this letter we replied that the disease described by him was undoubtedly *smallpox*. To have the place isolated, quarantined, and the premises disinfected; also to institute a general vaccination at once, or the result of negligence might be serious; and also to report regularly to this Board the progress of the disease. No word was received until the fourth of April. In the meantime I had written to him to know the reason why no communication was sent this office. The following is the doctor's reply:

Mokelumne Hill, California,
April 4, 1888.

G. G. Tyrrell, *M.D., Sacramento, California:*

Dear Doctor: Your letter of the second is at hand. I have not reported to you any of the cases which developed from the case I reported to you the fore part of last month, not from any dislike in giving the locality away, but from the fact that the cases that afterwards developed were of such a very mild form that I could not conscientiously report them *as smallpox*. There were four resulting from the primary case, three in the family in which he staid while sick, and one in that of a neighbor's. One was confined to bed two days, the rest were only indisposed a day or two, and were around town after three or four days after being taken down, and were never confined indoors, I am told, and with no more vesicles on the face and body than in an average case of chickenpox. One that had it *most mild* was a boy that had *never* been vaccinated. These were in West Point. The only cases in Mokelumne Hill were those in the Ashbury family, where there were eight, I believe, sick—at least these are all I have heard of. There have been no deaths at either places. I should be pleased to get some of the circulars on smallpox published by the State Board of Health, if you have any to spare.

I am yours fraternally,

AUSTIN C. WRIGHT.

As this disease seemed to be a subject of doubt, and was giving rise to a great deal of controversy among the physicians, and alarm among the citizens, at the request of our correspondent, Dr. J. E. Seymour Baker, the officials of Calaveras County summoned me by telegraph to settle the dispute. Accordingly, on March twelfth, we visited San Andreas, Angel's Camp, Duncan's Flat, and Murphys. We found that the cases in these neighborhoods were pronounced by Dr. Baker, of Angel's Camp, unequivocally smallpox, and as positively diagnosed as chickenpox by Dr. Murphy, of San Andreas.

This radical difference of opinion caused a great deal of ill-feeling among the inhabitants, which, unhappily, extended to the physicians in the county. Attended by Dr. Baker we first visited two children who were said to be coming down with chickenpox by the physician in attendance. We found them covered by the well marked rash of scarlet fever, with accompanying sore throat and other prominent symptoms. Across the ravine from this family lived a family among whom had boarded a man who had been six weeks confined to the house with what was pronounced chickenpox; he was then up and out. In this same house the landlady was confined, and died a week after. She left a baby that at the time of our visit was eight days old. Seeking the woman who attended this lady in her confinement, she told us that she had washed the dead body, and it was covered with a black rash, like measles, decomposition setting in very rapidly. Upon asking to see the eight-day old baby, we discovered it covered with papules, hard and shotty, just beginning to vesicate. This baby was seen by Dr. Baker two days after our visit, and vesication was general; in four more days the child died. Upon reaching Murphy's Camp we visited the hotel and there were shown a man in the desquamative stage of discrete smallpox, the crusts being, however, very thickly scattered over his face, arms, and body. In the same hotel we also saw the brother of this man, and also his son, who both had had the disease in a very mild form, the stains on face and hands being few. Across the street we examined a lady convalescent from the disease. She exhibited extensive stains on arms, face, body, and legs. She had been very ill for seven weeks, with what was designated by her physician as chickenpox. A little farther down were shown two children who were well covered with desiccating scabs, which had not yet dried upon their arms. These cases were also called chickenpox. We were now introduced to a bald-headed man, whose name has escaped my memory, who had several stains upon his head and face, who contracted the disease from two children in the hotel at San Andreas, whom Dr. Murphy declared had nothing but chickenpox. We now were shown several persons, young and old, who had the disease, and were now convalescent, and all presented the characteristic stains of the disease, some pitted, and others without any depressed scars.

Unhesitatingly we pronounced them all smallpox, and ordered immediate isolation and quarantine of those sick, and a general vaccination of those remaining well. Our declaration of the disease in this town was treated with most decidedly expressed unbelief; there were, however, a goodly few who thought that we were more likely to be right than wrong, and took steps accordingly.

Upon visiting and inspecting Angel's Camp we became satisfied that there was no smallpox in that town, neither had there been up to the time of our visit. We learned, however, that several cases were at Old Gulch and Sheep Ranch, but had not time to visit the ground and confirm the rumor.

We now visited San Andreas, where the disease first started. We learned that in the hotel a man from San Francisco stopped there over night who was ill; next day he continued his journey. Some few days after his departure three or four children developed an eruption in a discrete form; these cases were unhesitatingly declared chickenpox by Dr. Murphy, of San Andreas, who attended them. The disease was evidently very mild, as the children were scarcely sick with it. However, the laundry woman who washed their clothes took confluent smallpox, according to the testimony of Dr. Kelly, an old and respected practitioner of Angel's Camp, and after a few days illness died. The local physician testified that she died from miscarriage. From this case several others arose, but all were in a very mild form.

On arrival in San Andreas I was assured by Dr. Murphy that there was not a case of sickness in town; but hearing there was a young lady ill with the "chickenpox" just out on her, we saw Dr. Murphy and asked his company to the house, that we might see for ourselves a case of this remarkable outbreak. Upon entering the dwelling, and the room where the young lady lay, we were hardly surprised to see the poor girl literally one mass of pustular eruption, each pustule as large as a pea fully distended, and so closely packed that some had become confluent. We asked the "doctor" if he really called this a case of chickenpox. He replied that "certainly it was; it was just the same as all the others he attended, but the pustules were thicker in number and larger in size." When I declared it a case of confluent smallpox, he said: "Then all the books are wrong, if that is smallpox." Upon further inquiry we found that both father and mother of the girl had had the disease in a very light form. The stains still remained on their faces, but they were convinced they had chickenpox only. We learned subsequently that the girl recovered, deeply pock-marked, and that her brothers, who were permitted to visit her after our declaration of the disease, both took the disease, and one died after a few days' illness of hemorrhage of the bowels; the second brother recovered.

During my stay several cases were presented to my notice, all giving undoubted histories and evidence of having had the disease which we now officially declared to be, unqualifiedly, smallpox, and requested the Supervisors to call a meeting, divide the county into districts, order all cases now existing into quarantine, appoint Health Officers over every district, provide for vaccination for everybody, and that by vigilance and care they might prevent the spread of the disease. Your Secretary regrets to say that although his advice was taken by the Supervisors, my declaration of the disease was not believed. Even the press denied the truth of our statement, and as a result in a short time they had the disease in the county jail.

In Murphys they did accept the advice of the Board of Health, and the disease soon disappeared; but throughout Calaveras County the germs are still there, only waiting for a favorable opportunity to break out with renewed violence.

Soon after our return from San Andreas we were summoned by telegraph to Watsonville, Santa Cruz County, to settle a controversy that had arisen between the *regular* and *irregular* practitioners upon the nature of a disease which had there broken out; the *irregulars* claiming that it was pustular eczema, while the Health Officer, Dr. Chalmers, with Dr. Ireland and Dr. Spence, regular physicians, asserted the disease to be smallpox. Upon my arrival, in company with these doctors we visited a Miss L—— (an eczema case) and found her in the desquamative stage of variola, the crusts being remarkably thick and numerous on her face, arms, and limbs. From this house we proceeded to visit a Miss A——, whom we found convalescing from quite a severe attack of discrete smallpox, the crusts being all detached, the stains remaining. Dr. Chalmers, the Health

Officer, had had both these places quarantined, despite the earnest protestations of the occupants. We next visited Mrs. F—— and daughter, about four miles and a half from the town. We found the mother recovered from an attack of discrete smallpox, and the daughter suffering from a severe attack of confluent variola, just maturing. We next visited a Miss P——, living at the edge of the town. She was just coming down with what promised to be a confluent case. At the time of our visit the disease was in the papular stage. All these cases were so indisputably smallpox that we had no hesitation whatever in officially so declaring them; advised strict quarantine, isolation, disinfection, and fumigation, with division of town into districts, house to house visitation, and general vaccination without charge. We afterwards met the skeptical "medicos" and explained the differential diagnosis between eczema and smallpox, and recommended to them a closer study of the disease hereafter.

In Eureka, Humboldt County, five cases of smallpox were reported during March. In San Francisco the number had diminished to twenty-three; four were reported in Oakland; in Stockton two new cases appeared, three in Redding, and two in Millville; cases also occurred in Oceanside, Los Angeles County, Downey, Monrovia, Ontario, Point Reyes, Gilroy, San José, Santa Cruz, Watsonville, Sisson, West Point, Duncans Flat, Murphys, San Andreas, Sheep Ranch, Alvarado, Merced, and perhaps some other points not reported, as we found that the desire for concealment outweighed by far the sense of injury it did to the public. Both individuals and officials were very reticent in announcing the arrival of smallpox in their vicinity, and as a consequence the spread of the disease was practically unlimited; fortunately the type of the disease was particularly mild; in fact, some of those attacked were not even confined to bed, which made the afflicted doubt that they had the disease, and the supposition was more in the direction of varicella than variola. By the first of July the disease had almost entirely ceased, there being but one case reported throughout the State, and that in San Francisco.

Although smallpox ceased to be reported, and to all appearances had died out, we are convinced that the disease only slumbereth, and that as the winter season approaches it will awaken with renewed life and activity, especially in those places where sanitary precautions were wholly neglected, and sanitary measures not taken to destroy the germs where they existed during the past spring. That specific exterior agency which we call infection is there present, and only awaits some peculiar meteorological changes, and those alterations in the human system whereby the blood becomes possessor of some material quality which renders it susceptible to the action of the poison, to develop into the characteristic disease. Whether the smallpox thus developed will remain of the same benign character which was so prominent a feature of the epidemic that prevailed this past winter is a problem that time alone can solve. If it should prove to be of a malignant nature, then indeed will California have cause to lament the apathy and indifference which permitted her local authorities to be so lax in their duties to the public.

DIPHTHERIA.

The reports during the past two years give conclusive proof that diphtheria is a permanent visitor in the State. Every month some town or other reports its presence, and until some coöperative effort is made to suppress it by those sanitary measures which have heretofore, in other places, proved successful, we may expect to see it propagated and kept alive, to the injury of the State and the sacrifice of many young lives that ought to have been saved. We believe that the concensus of medical opinion is that diphtheria is never of spontaneous origin, but has its development dependent upon an infection from a previous case, and that whenever it appears among a community it is the result of exposure to the disease, either mediately or immediately. We find it in this State following the lines of travel. When it is severe in San Francisco it gradually radiates over the State, first attacking the centers of population, and then being carried into the remoter towns and villages. It prevailed during the fall of 1886 in several large towns in the State, sporadic cases constantly being reported in the smaller hamlets and villages. The general type of the malady was mild. In December of that year there seemed to be a recrudescence of the disease. In Maxwell, Colusa County, there was quite an epidemic of sore throat. In Sacramento, as diphtheritic croup, it was very fatal, and in San Francisco it seemed to have regained fresh vigor. During the spring months of 1887 it continued to be reported in various parts of the State. In Napa Dr. M. B. Pond writes that the cases were of unusual severity. As the winter approached the number of cases increased.

In October we received a communication from the Board of Trustees of Wheatland asking us to visit the town and decide upon a disease of the throat that was quite prevalent and alarming the citizens; a difference of opinion existing among the physicians as to its nature determined this course. Accordingly we arrived there on the afternoon of the seventeenth instant, and learned that a boy six years old had died, after a few days' illness, from what his attending physician called tonsilitis, and that several children were sick with the same disease. The public school was closed, and opinion was much divided upon the question of infection or non-infection. In company with the Trustees we visited the house of Mrs. S——, and learned from her that her boy, aged six years, was attending school; he came home with high fever, headache, and pain in his throat; his mother said that both his tonsils were covered with a white exudation, what she called a "thick coat of matter;" had no difficulty in swallowing, and no impairment of his voice; he was out of bed every day; slept with his brother, and latterly with his mother, and took, she said, plenty of nourishment; on the tenth day of his illness he became suddenly cold and covered with a damp sweat, lay over on the bed and died. The attending physician certified that he died from blood poisoning, the result of breaking of two tonsilar abscesses. This child's brother, who slept with him, a few days after had a chill, high fever, and sore throat. Upon examination exudation was seen on both tonsils, was very weak, but at no time had any difficulty of breathing or swallowing; he was now convalescing. The mother, who also slept with the child, had a sore throat, with, she said, a white deposit upon both tonsils. All these cases were pronounced tonsilitis by Dr. W——, the attending physician. Next door we visited a Mrs. H——, whose daughter, aged eleven years, was ill for seven days. Upon examination a well marked diphtheritic exudation was seen on both tonsils. The day previous, she said, a large piece of membrane had come away. She had no difficulty in swallowing or breathing, but had had high fever for four days; the fever is now subsiding and she is convalescing. Her physician, Dr. Melton, called her disease diphtheria. A brother of this young lady, living in the same house, had also a sore throat with exudation upon both tonsils; remains of exudation still visible, but the boy is convalescing. The mother of these children stated that she was taken with sore throat, without much fever, and recovered in a few days. We next visited the house of Mr. S——; found one girl with white patch on her tonsils; she had had fever, but was now able to be about. These three houses were together in a row, and communication between them unrestricted. We next crossed over a couple of blocks to the residence of Mr. B——; examined his daughter who had been ill with fever and sore throat; it was still quite red, but the diphtheritic patches had disappeared. She had, however, some faucial paralysis remaining.

The disease began in the house of Mr. S——. Here we found the pump standing upon one edge of the kitchen sink. The pump well was a bored one, one hundred and nine feet deep, and cased with iron, as indeed were all the pumps we examined. The sink being under the pump, its drainage fell therein, and the dishwater, etc., was carried through this sink to a vitrified-pipe sewer, without any trap, and the joints of which were loose. This sewer pipe was connected with the sewer pipe from the next door. It was likewise untrapped, and nothing that could be seen prevented the entrance of the sewer air into the house. From this source it is possible the infection was conveyed. We next visited the school house, which was closed. The water used by the children is supplied by a *cased* pump, and over one hundred feet deep. The privies are at least three hundred feet away, and situated upon a slope inclining from the pump. We learned that all the stricken children attended this school, and Mr. S——'s child was there on the day he complained of being ill, and the subsequent day, when he went home to bed with a sore throat. The children, as a rule, bring their own drinking cups with them, but on the day of our visit three or four drinking cups lay in the trough under the pump spout, and we were assured that the children drank out of any cup that might be handy, without discrimination.

The history of these cases is that on Wednesday and Thursday the S—— boy was in school, with high fever and sore throat. His mother thought it nothing but a cold, and accordingly sent him next day to school. He afterwards was confined to the house, in bed. The H—— child was taken sick in the adjoining house the same day, and the S—— children in the adjoining house the day after. The following Monday the girl of Mr. B——, two blocks away, was taken with the fever and sore throat, which is strong evidence that all these cases were derived from Mr. S——'s child, the one first attacked. The Trustees very properly closed the school, until it could be officially ascertained what disease they had to contend with. Upon eliciting these facts, and carefully weighing all the evidence given by the parties interested, we had no hesitancy in writing a report for the Trustees, giving it as our opinion that the disease was diphtheria, the first case being virulent, the child dying on the tenth day of septicæmia. It was also our opinion that all the other cases observed were diphtheria in a milder form, and that there was no tonsilitis, except that inseparable and usual with faucial diphtheria. We advised that the school house be immediately and thoroughly disinfected and fumigated, under the superintendence of a competent person, and that no child be admitted until this was perfectly accomplished. That all the houses and clothing where the disease had existed be also disinfected and fumigated, and that none of the convalescent children be permitted among the other children for at least two weeks longer, and not then except the Trustees were perfectly satisfied that disinfection had been fully accomplished. We also strongly recommended the appointment of a competent Health Officer, with power to have the town thoroughly cleansed and disinfected; the privies abolished, and earth closets substituted; the cesspools emptied and cemented, to prevent soil pollution, and that they be again emptied every few months. The directions being in a great part acted upon, the disease disappeared in a short time.

We have related the incidents of this visit to show how easily a disease may attain even epidemic proportions from neglect of the first case, or ignorance in determining its nature.

In a place called Pine Creek, some eight miles east of Cana, and sixteen miles from Chico, an outbreak of diphtheria occurred about December. Dr. Harvey, of Vina, had twenty-eight cases, with two deaths. The first two cases came from the foothills. Dr. O. Stansbury, writing from Chico, says: "We would wonder, if we knew the locality where these cases were reported to have been, that the disease should exist there, as it is very near the foothills, sparsely settled, and where we would naturally suppose the drainage to be good."

We were unable to ascertain the history of the two cases from the foothills, from which the disease spread; but the lesson teaches us that neither sparseness of population, good drainage, nor elevation will prevent the spread of diphtheria, if general prophylaxis is neglected.

Dr. J. H. Miller, of Redding, reports in November, 1887, an epidemic of laryngitis, with kindred throat and bronchial inflammations, with six deaths attributed by him to the hot days and warm nights and the constant cloud of dust in the principal streets of that city. "One autopsy was made and the disease," he says, "definitely ascertained to be *true croup.*" The doctor says it was not diphtheria; that the prevailing disease was laryngitis, with or without exudation. In the present state of medical opinion, we fear the verdict would be diphtheria.

In December a limited epidemic of diphtheria occurred in and some few miles from Suisun, which were under the care of Dr. Downing; some of them proved rapidly fatal. Their origin was not traced; the disease continued for a couple of months, when it gradually subsided.

In April of this year, in Rocklin, quite an epidemic of the disease prevailed. Dr. H. E. Stafford reports forty-four cases, with many other cases of sore throat, which, although quite mild, were probably diphtheritic. The origin of the disease was traced to a family whose sanitary condition was of the worst possible description. From this family, it was communicated to neighbors' children, who were playing close by. Another factor, in the spread of the disease, was an open sewer or ditch, that was used as a receptacle for a large portion of the filth of the town, and from which was constantly exhaled a most offensive odor. Owing to the comparatively dry winter, this drain was not washed out as usual by the winter's rain, and hence its putridity. If an example was needed of the close relation that filth bears to disease, it may be found in the history of this epidemic in Rocklin. Founded in filth, fostered in an insanitary home, the germs cultivated and diffused by the decomposition of animal and vegetable matter in an open ditch, polluting both air and soil, the result could be no other than it was, with its attendant deaths, that might have been prevented.

In a letter received from Dr. A. J. Comstock, of Ventura, he describes an outbreak of measles complicated with diphtheria. As the doctor's description is very interesting, we will take the liberty of transcribing it. He says: "The first case was that of a child brought by its mother from Monrovia, Los Angeles County, and the mother thinks it was exposed on the train, there being a sick child in the seat next them, which was feverish and had an eruption on the skin. Her child was taken ill two weeks after reaching here. The first symptoms were sore throat, enlarged cervical glands, high fever, prostration, but with this, coryza congested conjunctiva, and other prodromes of measles. Put child on treatment for diphtheria; second day eruption of measles appeared. The child was taken down in a small country house where there was a family of five children who had never had the measles. Two other families (relatives) were exposed the day the child was taken sick. Nine children of the several families exposed were taken in due time with the measles, and all complicated with diphtheria, most of the cases being the nasal form. One died of membraneous croup in this county; one was taken to Monrovia and died of membraneous croup. These two were brothers; one two and a half years, the other four years old. All the older members of the family had diphtheria more or less severely. Several are under my charge, still being very dropsical, and passing large amounts of albumen in their urine. Some of the children had albuminous urine with dropsical following, as well as different paralyses among them all. Have managed to confine the disease to the three families mentioned. I consider it remarkable to see the two poisons (measles and diphtheria) break out in the manner stated. It would not seem so strange were it scarlatina and diphtheria."

From the history of these cases we are led to believe that it is possible for two different poisons to be present in the system at the same time, and manifest their presence by their peculiar symptoms; what the unknown factor is that inhibits dual disease in the majority, and permits it in the few, would be an interesting problem to solve. The power of producing this disease has been ascribed to as many different causes as there have been conditions under which it has been observed. It has been generally described as a *filth disease*, that is to say, that it owes its existence to sewer gas, cesspools, impure water, decaying vegetation, overcrowding, etc.; but such is not, we believe, the fact, as cases have occurred and death has entered into homes where no such conditions existed. It is found on the tops of mountains and in secluded valleys, where no possible condition likely to give rise to the disease existed. We are therefore led to infer that it is not dependent upon conditions for its existence, but is a disease produced by a pathogenic micro-organism, and therefore does not originate spontaneously, as we believe no combination of unhygienic conditions can originate life where none existed before. Although the presence of the living germ is necessary to produce the disease, there must be also an unknown factor in the individual, in order that it may germinate and grow. What that factor is, we know not, but we do know that unhygienic conditions, emanations from decaying organic matter and other filth, produce in the human body a deterioration that renders it susceptible to disease whenever it comes in contact with disease germs.

As sanitarians we are concerned as to the means of preventing infection, diphtheria not being an emanation from the unknown, but a something which is carried from place to place. Isolation is, therefore, one of the most reliable means whereby the disease is limited. Unfortunately this preventive means cannot be complete until the public mind is impressed with a belief in the contagiousness of the disease, and that, unlike smallpox, one attack does not secure immunity from a subsequent one. Precautions will then be taken to limit the visitation of the sick by the well; to prevent children attending school when diphtheria is in their dwelling; to remove all carriers of contagion, and all conditions likely to foster the disease or propagate its germs. We would recommend, as a means to this end, that the Legislature pass a law making it compulsory on physicians and householders to notify the local authorities, whenever a case of diphtheria occurs within their knowledge, and then designate the place of its location by a distinctive card or flag, to warn the public that contagious disease is within. It should also be made compulsory to have every house, in which diphtheria has been, disinfected and fumigated, together with the persons occupying the same. By these means we may hope, in accordance with the completeness with which the means are used, to restrict the spread of a disease which is more fatal than smallpox, and, perhaps, less under the control of therapeutic treatment than any disease now known.

SCARLET FEVER,

During the past two years, although present in the State to a greater or less extent, has shown no tendency to epidemicity or any extreme malignancy. In the fall of 1886 it was noticed in a great many towns, but the type was so mild that scarcely any fatality attended it. The infectiveness of this disease is exemplified by a case that occurred in Fort Bidwell. Dr. Kober writes that the disease was conveyed from Warren Valley, in Oregon, sixty miles away, by an uncle of the child, who, having been exposed to the disease, came into the fort and slept upon a bedspread upon the floor, in the residence of the child. Next day the child played upon this spread, and ten days after developed the fever and died. Under the complete sanitation employed by Dr. Kober, the disease was confined to this one case. At a later date Dr. Kober writes: "I was in hope that by proper sanitation, scarlet fever would be limited to an isolated case or two; but, unfortunately, the family, unknown to me, had aired the bedding before I got it disinfected, and, as a result, twenty-six persons were attacked, with six deaths." He further says: "Two of the fatal cases were terrible from the very start, although contracted from mild cases."

In another instance, related by Dr. Edward Gray, of Benicia, he says: "The disease (scarlet fever) suddenly made its appearance in town June second. Next day it appeared in two other families, and finally in two more. In my opinion, it originated from the contact of some of our townspeople and children with the participants in the Caledonian picnic held May twenty-fifth, at Shell Mound Park, Oakland. Twelve cases were developed, of which two died. As these cases occurred simultaneously, eight and ten days after exposure, and all occurring in those attending the picnic, the conclusion is almost irresistible that such was its origin."

Dr. Adams, of Ione, also relates the instance of an outbreak of scarlet fever in his town. Its origin was traced to a family who had scarlet fever some months previously, but who attended a picnic without taking any precaution to have their clothes disinfected before doing so. The disease attacked sixteen children simultaneously, and some forty-eight persons were attacked with sore throat forty-eight hours after the picnic, at which ice cream was freely dispensed. It is possible that some connection existed between the fever, the sore throat, and the ice cream, but Dr. Adams was unable to trace it.

Some few cases of scarlet fever were reported in Hopland by Dr. H. G. Pike, but the type was exceedingly mild, and called for no comment. Indeed, the remarkable features about the scarlet fever of the past two years was its sporadic character; usually so communicable its limited extension was so marked as to excite surprise. Why the disease should be so virulent and fatal at one time, and so mild at a subsequent manifestation, is one of the problems of medicine that await further research.

In London, where, in 1887, the disease was epidemic, as many as twelve hundred cases being in hospital at one time, its spread was attributed to the unusually warm weather prevailing at the period.

In this State, during the same period, the weather was very much warmer, yet it did not increase the prevalence of the disease, nor cause its extension beyond its original place of development. Some cases, however, have occurred and attended, we regret to say, by fatal results, from the carelessness of those upon whose premises the disease existed. In one particular case a gentleman was visiting a family in which scarlet fever prevailed; he was not made aware of the fact, and unconsciously conveyed the germs of the disease to a distant part of the city; there he infected a friend's child who died after a few days' illness. The examples of contagion conveyed almost incredible distances, warns us that some means ought to be provided by law whereby the dissemination of disease could be lessened, if not wholly prevented. It should be made a penal offense to have any infectious disease within a house without a notification to the public, either by a card outside the house or a colored flag hanging in some conspicuous place, to warn the visitor or the traveler that infection was within. This warning would have saved the valuable life above alluded to, and if adopted would lessen the spread of disease most materially. It is done in smallpox, not half as dangerous a disease as diphtheria or scarlet fever, and why not have the same rule applied to scarlet fever and kindred contagious diseases?

MEASLES

Were entirely absent from the State during July and August, 1886. In September a mild type of the disease appeared in Napa County. It was next heard of in Monterey County, Mendocino County, and Shasta. The disease gradually spread until measles prevailed everywhere, but it was not until December of 1887 that it became really epidemic. It prevailed extensively in Sacramento, Oakland, San Francisco, and all the larger cities. In February of 1888 it became quite severe, and in many cases the eruption was mistaken for that of smallpox, being so very dark and markedly papular. The fact has been noted that smallpox is often preceded or immediately followed by measles. This was the case in the great epidemic of 1670, when, according to the observations of Dr. Thos. Sydenham, the measles of that date introduced a kind of smallpox, which he chose to entitle "anomalous smallpox," as he found it different in some particulars from the epidemic form that preceded it. This distinguished physician was the first to describe the difference that existed between smallpox, scarlet fever, and measles, and laid down rules to distinguish one from the other. Up to this time measles and smallpox were often described together, as if one was a modified form of the other. During the prevalence of smallpox it was remarkable the number of cases of measles that were mistaken for smallpox, and in some instances quarantined for that disease. The chief characteristic of measles during the past two years was the generally mild nature of the attacks, and the rarity of the malignant type during the period.

TYPHOID FEVER,

During the years 1887–8, was remarkable for the general sporadic nature of the disease wherever it appeared. There seemed to be no tendency toward epidemicity, and the examples were generally traced to some local cause. It is becoming more and more evident that without a specific cause, typhoid fever would become extinct. During the fall and winter of 1887, typhoid fever was reported as prevailing extensively in Sierra City, but inquiry made of Dr. Jas. Tully contradicted the truth of the assertion. He writes that the disease reported as typhoid was really a remittent fever that ran a course of from ten to twenty-one days. He further says that he saw but one case of genuine typhoid fever during the summer. He considers the frequency of the remittent fever to lack of sewerage and the pollution of the small streams and marshes by refuse matter.

In San Diego, during the fall 1887, typhoid fever was reported as prevailing to a great extent. Dr. T. L. Magee, Secretary of the San Diego Board of Health, in reply to a letter of inquiry from Dr. Orme, President of this Board, admits that there were quite a number of cases of fever from time to time, but characterizes them as non-specific continued fever, although he confesses that some practitioners called them typhoid, and others typho-malarial fever. In a letter received from Dr. Huntingdon, United States Army, in medical charge of the garrison at San Diego, and a practitioner of thirty years' standing, he states that in the barracks during the past few months he has treated four cases of undoubted enteric fever. One in a girl thirteen years old and three among the soldiers. He believes that the girl contracted the disease by frequent visits to a part of the town suspected of being infected, and in the soldiers the infection undoubtedly occurred outside of the garrison and by frequenting places of insanitary reputation. He also reported seven cases in private practice, and is of the opinion that typhoid fever is quite prevalent in San Diego: " * * * Like all new and rapidly growing places, San Diego is and will be prone to the reception of all kinds of disease, incident to the presence of filth and the want of sanitary care, but it is to be hoped that the completion of our new sewerage system will make a change for the better." Since that letter was written the new sewerage system has been completed and the health of the city materially improved, neither typho-malarial, typhoid, nor remittent fever have been reported, except in the sporadic form, and from the admirable system of sewerage, and the very efficient Board of Health and its excellent and energetic Health Officer, Dr. Gochnauer, we expect San Diego will become one of the healthiest cities in the State and the least subject to any of those diseases which are bred in filth and matured in insanitary conditions and surroundings.

We do not think that in this day there can be any question as to the intimate relation between filth and disease, and although it may not be always possible to trace cause and effect, yet it is an undoubted fact that the decomposition of organic debris, animal or vegetable, causes pollution of both air and soil, and is a constant source of deterioration of health, even where actual disease is not the result.

Although it is now a generally observed fact that typhoid fever is closely related to dry seasons and coincident with low water in wells, yet these two past seasons in California did not develop any unusual prevalence of typhoid disease, although the weather was dry until late in the year. As a knowledge of the disease and the necessity that exists for disinfection of the discharges from the bowels becomes a matter of common education among the people, we will find that typhoid fever will be confined to the few, and to those who persistently pollute the soil about their houses with slops, garbage, privy vaults, and cesspools improperly constructed, who will not be persuaded that a well fifty feet from a privy can be contaminated by percolation through the soil, or who declare that excreted discharges are perfectly harmless when deposited in the privy vault. It is only through such people that the germ is propagated to the injury of those who unfortunately or inadvertently are brought in contact with them.

Investigation shows that polluted water is the most prolific source of disease in the human family, especially of typhoid fever, and numberless epidemics of this disease have been directly traced to a well polluted by surface drainage and infected with typhoid fever germs. One of the most important facts yet discovered in the pathology of typhoid fever is the detection by Birch-Hirschfield of germ spores in his stained cultures of bacilli. Gafky found that in potato cultures, kept at the temperature of the body, spores were formed. They were also observed by Sternberg, Flugge, and others; but this is denied by Buchner, Michael Simmonds, and some other experimenters.

Another important discovery was made by Prudden, and that was that typhoid germs were capable of growth and propagation after one hundred and three days' freezing in ice; hence, the importance of seeing that our ice is supplied from sources that are absolutely free from the possibility of sewage contamination. It has also been determined that germs exposed to a heat of 56° C. are not destroyed, and the same investigation showed that alternate thawing and freezing did not destroy the germ. It was also demonstrated that these germs will grow in various media. Milk is one of their favorite culture grounds, and some of the most formidable epidemics have been inaugurated by milk which had been contaminated by the bacillus of typhoid. We must, therefore, in seeking the causes of typhoid fever, look beyond the sewage, and examine carefully the water and milk supply, as these carriers of disease may be polluted from sources that were not even suspected.

As an extended knowledge of what is known as "Heisch's test" would enable every one familiar with it to test in a general way the potability of water, we here insert it: Take six or eight ounces of the water in a *perfectly clean* bottle, and add to it fifteen or twenty grains of the purest white sugar. The bottle must be filled with the mixture and the cork tightly adjusted, so as to exclude the air completely. It is now placed in a warm situation for forty-eight or seventy-two hours. If after twenty-four hours have elapsed the transparency of the water be noticed to have been disturbed, or if it has become cloudy or milky, or if any bad smell or fermentation has developed, the water should unhesitatingly be rejected as unfit for drinking. It is contended by Heisch that the cloudy appearance in the water at the end of twenty-four hours is positive evidence of sewage, or putrescible contamination. This test, so simple that any one can employ it, ought to be applied to every water used for drinking purposes, as, if not perfect as a test, it at all events gives warning that enables us to have such suspected water analyzed by a competent chemist.

MORTUARY STATISTICS.

For the fiscal year from June 30, 1886, to June 30, 1887, the number of deaths reported to this Board were ten thousand three hundred and sixteen, inclusive of three hundred and fifty-seven still-births, the average population being five hundred and seventy-six thousand six hundred and thirty-eight. This gives us an annual death rate of 17 per cent. Owing to our deficient, we might say useless, registration law, it is impossible to collect all the deaths in the State.

The estimated population of the State being one million and a quarter, or perhaps a little less, we calculate that we have succeeded in collecting more than half the deaths that have occurred within the fiscal year. As those towns and villages that have failed to make any returns are small, and whose mortality is very limited, we are justified in believing that six thousand deaths would amply cover their death rate in the year. With this calculation we estimate our yearly death rate for the entire State to be 13.50 per thousand, which will indicate the extreme healthfulness of California during 1886–7, as far as our imperfect statistics can do it.

If we could only impress our legislators with the necessity that exists for a registration law that would make the returns for mortality a certainty, we would be able to present to the public a report that, being accurate and without exaggeration, would astonish the people of the Eastern States at the salubrity of our climate, and the consequent smallness of our mortality from any epidemic disease. Among the ten thousand three hundred and sixteen deaths recorded we find—

Consumption was fatal to sixteen hundred and seventeen—a percentage of fifteen of all deaths registered. If we compare this percentage with that occurring in the Eastern States from the same disease, we will find that although from the number of persons affected by this disease that annually come to us, we would expect a large death rate, our percentage is much smaller than in most of the Eastern States.

That the favorable conditions of our climate in enabling consumptives to pass the greater part of the year out of doors, is a prominent factor in prolonging the lives of those suffering from tuberculosis, there can be but little doubt, as very many of those coming from the East are in the very last stages of the disease, and yet, under the invigorating air of California, they gain strength and flesh, and perhaps live as many years as they would months in the climate from which they came. Among the sixteen hundred and seventeen deaths registered we find four hundred and ninety-seven natives of the Atlantic States; six hundred and four foreigners; three hundred and nine natives of the Pacific States; one hundred and forty-two of these being under ten years of age, and two hundred and seven whose place of nativity was unascertained. We are justified, therefore, in asserting that the large majority of those dying of consumption in California come to the State already infected with tubercle, and that these infected people are a possible source of infection to others, and tend to develop the disease in those of a scrofulous diathesis, who may be obliged to remain in contact with them, socially or otherwise.

Pneumonia, or acute inflammation of the lungs, caused six hundred and eleven deaths, less than one third of the deaths attributed to consumption; a percentage of 5.92 of all deaths recorded. Pneumonia has not been epidemic within the State during the year, or, indeed, very prevalent in any particular place. The seacoast and the higher altitudes furnished the greater number of cases, the temperature being lower and the humidity greater than in the interior counties.

Bronchitis was productive of one hundred and eighty-six deaths, ninety-nine of which were children under ten years of age. The months showing the highest death rates from this disease were the winter months of December, January, and February, and the largest mortality in those over sixty years of age. Bronchitis, like pneumonia, is much more prevalent in the mountains and along the seacoast than it is in the valleys, the snow line, of the former and the humid fogs of the latter bearing a close relation to the frequency of the disease.

Diphtheria, which seems now to be endemic in the State from causes that should not exist, produced death in three hundred and seventy-six instances recorded. If we add to this number at least three hundred more that were not reported, we will approximate very nearly the number of deaths from this disease in the State. If, for a moment, we reflect that all these deaths from diphtheria might possibly have been prevented by proper sanitary precautions against the spread of the disease, and preventive measures against its introduction, we are forcibly impressed with the necessity that exists for properly organized Boards of Health, officered by men who are conscious of the great responsibility that devolves upon them to save the lives of helpless children from this fell destroyer. Among the deaths here recorded, we find no less than three hundred and three were under ten years of age, forty-four under twenty, and ten under thirty years old. All young, from the infant in the cradle to the man in vigorous life, alike were consigned to an untimely grave.

The largest number of deaths occurred in San Francisco, where the disease prevailed to a greater or less extent during the entire year. Its highest death rate was in November, December, and January, when the deaths averaged nearly thirty-eight a month. The lowest death rate was in July, August, and September, when the average deaths from diphtheria were a little over seven a month. By this we learn that ochlesis, which naturally occurs among the poor in large cities during the winter months, is probably a constant factor in the spread of this disease. Practically we find it impossible to isolate diphtheritic patients among the poor; crowded, as they are, in one or two, or, at most, three rooms, with half a dozen children, intercourse cannot be forbidden with success, and until we are able, through public sentiment, to build hospitals for this class of patients, diphtheria must occur and spread, to as great a danger of the wealthy patron as to the poorest tenant.

In the interior towns and cities the disease was mostly sporadic, in no place did it rise to the dignity of an epidemic. The general public is now so well instructed in the contagiousness of the disease that physicians find little trouble in enforcing sanitary regulations in the destruction of all articles used by the patient, and in general fumigation of the premises, where such is possible; of course, in crowded tenements, it cannot be done with satisfaction, but the attempt is better than none. It should be a law of the land that every house or tenement having within it a case of contagious disease should be compelled to give a notification of the fact to the health authorities, or other appointed officers, and at the same time exhibit a distinctive flag or written card to that effect.

Croup is credited with one hundred and sixty-four deaths during the year, being nearly half as many as died from diphtheria. As the evidence accumulates we are approaching the time when there will be no distinction made between diphtheria and membranous croup, their identity being firmly established. We notice in our reports that wherever a death from membranous croup is reported there will be found diphtheria in the neighborhood. This is without exception the rule, and no stronger evidence of their co-relation can we think be found than this very fact.

Scarlet Fever.—The deaths from scarlet fever during the year were sixty in number, which shows how very mild the type was in those attacked, the percentage being a fraction over half of one per cent of the total deaths. The most difficult duty the sanitarian has in this disease is to convince the public in the first place that there is no difference between scarlatina and scarlet fever, that they are in fact one and the same disease. The next difficulty to overcome is to convince those afflicted that they are as likely to have serious consequences ensue after a mild attack of the fever as after a severe one, and that infection can as readily be conveyed by the patient not sick enough to go to bed as by the sufferer from the most malignant type of disease. In consequence of this very general obtuseness of the public we have scarlet fever in our schools, traveling in our street cars and railway trains, playing on the streets, and sitting in our churches and theaters. It will continue until that peculiar something comes in the constitution of the body that determines the type to take on malignancy, and then, when death is sown broadcast, the sufferers will learn the value of isolation, disinfection, and fumigation.

Measles, although prevailing to a large extent, occasioned but thirty-four deaths. The highest mortality in any one month being in April, when five deaths were recorded; three of the deaths occurred in adults, as a result of capillary bronchitis complicating the disease. If we compare this mortality with that of some Eastern States, we will appreciate how little we suffered from death in this prevalent disease. In the report of the State of New York for 1887, we find that in the three winter months nine hundred and nineteen deaths were reported, and fifteen hundred for the year from measles. In Wisconsin the deaths averaged 2 per cent, in Illinois 2.21 per cent, in California the deaths averaged nearly one fourth of 1 per cent. No part of our State has been exempt from measles at some period or other through the year, but the type was so mild and the meteorological conditions so favorable that, as is seen above, death rarely ensued except from some secondary cause.

Whooping Cough caused as many deaths as scarlet fever and a few over, sixty-four deaths being attributed to it. They all occurred in children under five years of age. It has occurred during the year in various parts of the State, and was quite prevalent during the winter and spring months. In some localities it was epidemic.

Cholera Infantum was the cause of two hundred and sixteen deaths. That this disease depends much upon meteorological conditions and the result of heat upon food, we will endeavor to show by recounting the deaths by months of the fiscal year. In July, the deaths were forty-seven; August, twenty-nine; September, twenty-seven; October, sixteen; November, ten; December, eight; January, three; February, three; March, one; April, six; May, fourteen; June, forty-three. It will thus be seen that as the summer and autumn season waned, so did cholera infantum, and when the temperature began to rise in April, cholera again appeared in increasing numbers on our mortality list, and attained its maximum in June and July, the warmest months in California.

Diarrhœa and Dysentery prevailed to a greater or less extent in every part of the State, but nowhere in what might be termed an epidemic form. They produced only one hundred and eighteen deaths, not quite 1½ per cent of the total mortality, which is strong evidence that the diseases had no malignancy in their character. We have no doubt the frequency of these diseases could be materially lessened if those suffering from them had taken even ordinary precautions to avoid the cause. Much of it was undoubtedly provoked by insanitary conditions; by decaying vegetable and other garbage polluting the water used for drinking purposes; by exposure during the summer season in sleeping out of doors upon the damp ground; by eating quantities of unripe and too ripe fruit; by overheating and then drinking large quantities of iced or very cold water. People that avoided these sources of bodily disturbance and stomach disorders did not suffer from diarrhœa or dysentery, although living under the same meteorological conditions and exposed to the same thermal inconveniences. Fortunately for those attacked, the type was particularly mild, and readily yielded, in the great majority of cases, to simple household remedies, or the greater skill exercised by the family physician.

Typhoid Fever.—Two hundred and eighty-nine deaths were reported as being caused by this undoubtedly prevalent disease. If to these we add the twenty-one deaths ascribed to what is called typho-malarial fever, which is now generally conceded to be typhoid fever running a somewhat different course from the ordinary enteric fever, we have a sum total of three hundred and ten deaths from the disease, or 3 per cent of the total mortality. The largest number of deaths, forty-five, occurred in October. In August there were thirty-six, and in September and November twenty-eight each. The remaining decedents varied from fourteen to twenty-two monthly. This is a very small mortality, and testifies to the mildness of the fever; indeed, there was no tendency to epidemicity, the cases being all sporadic and endemic. The diffusion of knowledge by the State Board has, it is believed, put the public upon its guard against the spread of this fever by causing the adoption of strict measures of disinfection of all the excretions of the sick, and having a careful regard to the sources of the drinking water, as it is in the vast majority of cases due to polluted water that the fever arises. It is true that with a large class of persons it is difficult to make them believe that bright, clear, sparkling water could carry within it the seeds of disease and death, or that such water could be contaminated by seepage of house slops or outhouse drainage. The Board, however, has hope that by continuance of precept upon precept and line upon line, to so educate the great mass of intelligent people in California to the fact that typhoid fever is a matter of choice and determined by sanitation that in the near future, insanitary dwellings and surroundings will be the exception and not the rule, and as a consequence the elimination of typhoid fever as one of the causes of our mortality. There are few diseases whose origin is more certainly known, and with this knowledge we ought to be able to remove the cause.

Smallpox.—For many years the State was free from smallpox, but in February, 1887, it was introduced from Mexico into Los Angeles, and there caused sixteen of the deaths recorded from the disease. In June we find that two deaths occurred in San Francisco, where the disease was introduced by the Chinese. Up to this time it had not infected any other parts of the State.

With this partial review of the causes of death in the fiscal year 1886–7, your Board will learn that the State presented a very healthy condition of its inhabitants. Its mortality was small, it was free from any dangerous epidemic disease, and the work of the State Board was becoming appreciated by the public. We will now present for your approval a—

REVIEW OF THE FISCAL YEAR 1887 AND 1888.

We find recorded during this period twelve thousand three hundred and twenty deaths. The average population being six hundred and eighty-four thousand three hundred and twenty-two per month, and the average deaths one thousand and twenty-six, the percentage would be 18; but if we add six thousand deaths not returned, which is a large estimate, our death rate would average for the year 14.6 for the whole population, which is a trifle over the calculation for 1886. Owing to the slight increase of deaths, we find that—

CONSUMPTION

Caused one thousand eight hundred and thirty-two deaths, an increase of two hundred and fifteen over the previous year. This may be accounted for by the large immigration into the State during the year—seven hundred and eighty-two of the deaths being among foreigners; five hundred and eighty-three in persons from the Atlantic States. Only three hundred and fifty-five died that were born in the Pacific States. We thus infer that the increased mortality from consumption was among those who sought our equable and invigorating climate in the vain hope of restoration to health.

PNEUMONIA

Also shows an increase in deaths, one thousand and thirty-nine being recorded, an increase of four hundred and twenty-eight over the record of 1886. We can account for this record when we remember the increased area of the State heard from and the larger population reporting. The disease was quite prevalent from October, 1887, to June, 1888, in most of the coast towns, and was especially noticeable in San Francisco. It was not epidemic anywhere in this State, but was observed as occurring in sporadic form with great frequency.

BRONCHITIS

Caused two hundred and sixty-two deaths, which is also a larger mortality than the preceding year, one hundred and forty-five being infants under one year of age. The disease, therefore, was not prevalent nor fatal to any extent among the old, where its lethal effects are chiefly felt, only thirty-six persons over fifty years of age succumbing to it.

DIPHTHERIA.

During 1887–8 the number of deaths reported were three hundred and fifty-eight, which, added to two hundred and three from membranous croup, makes the sum total of mortality from these twin diseases five hundred and sixty-one, which is very little in excess of the mortality of the preceding year.

WHOOPING–COUGH,

Although quite prevalent, caused but forty-two deaths—evidence of the mildness of the type or the constitutional robustness of those attacked. It prevailed more particularly during the spring and summer months, when the weather was most favorable for its treatment by outdoor exercise.

SCARLET FEVER,

Although quite prevalent in many parts of the State, preserved its mild type and endemic character. Fifty-nine deaths were recorded from it during the year. The months of its greatest fatality were January, March, May, and June, which is strong evidence that meteorological conditions play but a small part in the etiology of the disease, and that its fatality depends more upon the constitutional condition of those affected and the virulence of the poison imbibed than upon the question of season or condition of the weather.

MEASLES,

During the year, became epidemic in many places, and was especially prevalent during November, December, January, February, March, and April. The number of deaths recorded for the year was one hundred and thirty-nine, which indicates the extent of its prevalence and the pernicious effect of winter weather upon its results, as we find that in November there were but four deaths, in December eighteen, in January thirty-five, in February twenty-three, in March twenty-eight, in April thirteen, in May six, and in June two. There were twelve deaths in adults between twenty and forty years of age, the remaining one hundred and eighteen being in children under ten years. As the epidemic was scarcely severe enough to exhaust all the susceptible material, we may expect a recrudescence of the malady during the coming fall and winter months.

SMALLPOX.

Smallpox, as before stated, made its appearance early in 1887, and during the fiscal year to June 30, 1888, caused ninety-four deaths. The greatest mortality was during the months of December, January, February, and March, when seventy-five deaths occurred. Only two deaths were reported in May and none in June. There were other deaths from smallpox in the State that were not reported. In Calaveras County smallpox was quite prevalent, and several deaths occurred from it, but were not reported, as, unfortunately, our registration law is in such condition that no penalty can be enforced for its disobedience. If this type of the disease had not been of the very mildest character, and devoid of any epidemic tendency, the spread of the disease would have been unlimited, and the death rate consequently increased.

CHOLERA INFANTUM

Caused two hundred and fifty-one deaths, the largest mortality in any one month being in October, 1887. This was owing to the very abnormally warm weather during that month. In the northern end of the Sacramento Valley, according to the Signal Service reports, the temperature was nine degrees above the normal for the month. The deaths in October were fifty-one. In November, when the temperature was lower, but still warmer than normal, the deaths decreased to twenty-five, and in December, when the temperature was only one degree warmer than normal, the deaths were recorded as eight, and in January had fallen to five. Temperature has, therefore, an undoubted influence in the evolution of cholera infantum, and, when combined with insanitary surroundings, has much to do in determining its fatality.

DIARRHŒA AND DYSENTERY

Were quite prevalent throughout the year, and occasioned one hundred and fifty-nine deaths. These diseases were generally observed to be of a mild character, and readily controlled by suitable remedies. The greatest fatalities occurred in October and November, when the weather was abnormally warm, and it seemed, as in cholera infantum, to determine the increased death rate.

SCARLET FEVER,

In an exceedingly benignant form, was present in various parts of the State; it produced only fifty-nine deaths that were so reported. The greatest mortality was in January, when ten deaths were reported. There were nine in March, May, and June, which indicates that temperature has but little influence in determining the result of the disease. There was no epidemic tendency manifested in those places where the disease was observed, and the deaths that occurred were oftener from the secondary results appertaining to the disease than from the malady itself.

TYPHOID FEVER

Was a little more prevalent during 1887 and 1888 than in the previous year, the deaths being four hundred and fourteen—an increase of one hundred and twenty-five; but this may be accounted for by the increased number of precincts heard from, and the consequently increased estimated population. The largest number of deaths was in the winter months of November, December, and January, when fifty-eight deaths were recorded for each. In August, September, and October, the average was thirty-one in each month, and was only exceeded by June, when thirty-seven deaths were reported. We are led to conclude that local conditions determined the result in these cases, rather than the season; as usually the frequency of the disease and its fatality is greater in the fall than in the winter, although it has been remarked in San Francisco that the advent of the rainy season increases the disease, and that during the winter months there is experienced the greatest mortality.

CEREBRO–SPINAL FEVER

Is credited with one hundred and forty-four deaths. The cases were all sporadic, and occurred in different parts of the State; as far as learned, there was no tendency to epidemicity, which is one of the characteristics of cerebro-spinal fever in its infective form, and therefore it is open to doubt as to whether the disease was properly classified or not. Eighty of these decedents were under five years of age, which increases our doubt as to the correct nomenclature.

MENINGITIS.

We find that under this head there were recorded two hundred and eighty-nine deaths, of which one hundred and ninety-four were under five years of age, and ninety-five over that age. This classification includes the tubercular as well as the purely inflammatory form of disease, and no deductions can be drawn as to their relative frequency, except by considering the age of the decedents.

Before concluding this report, we must call the attention of the Board to the fact that, as yet, no work has been done upon our—

MINERAL SPRINGS.

The mineral springs of this State, containing, as they do, every quality of water that has made the continent of Europe so famous, are now hardly known outside the area of their distribution, and for the simple reason that no reliable and State analysis has been made to determine their medicinal properties. Some of our springs have such a reputation within the State that they are visited from all quarters of it, and hundreds derive the greatest benefit; again they are visited by those whose maladies are not benefited by the waters, but rather aggravated. Such cases are not only injured themselves, but they do injury to a valuable remedial agent, by decrying as valueless what, under judicious selection, would probably be of great service.

Four years ago, through the instrumentality of your Board, a State Analyst was created by law. The State Board was to receive all waters desired to be analyzed, transmit them to the State Analyst, get his report, and transmit it to the sender as an official document containing the result of the water analysis. Some samples of waters were so sent, but the Analyst declared that his time was so occupied in the affairs of the University of California that without assistance it would be impossible for him to undertake an analysis of the mineral waters of the State. Under these circumstances it is hardly necessary to remind your Board that the mineral springs remain unanalyzed, to the great detriment of the State, as our mineral springs are of undoubted value, and, if their medicinal properties were properly placed before the public, would induce a large immigration of those valetudinarians who now seek European shores in search of medicinal waters that are at their very doors, which only need analysis to determine their value. We would therefore recommend that your Board take active measures, through your Legislative Committee, to place this matter before the Legislature, and ask that a sufficient sum be placed in the appropriation bill to enable the State Analyst to employ sufficient assistants to thoroughly analyze the principal mineral waters of the State and determine their quality. It is a matter of such extreme importance to the community that no difficulty should be experienced in getting the amount sought for.

YELLOW FEVER.

This disease having appeared in an epidemic form in Florida and adjacent States, and emigration coming steadily over roads likely to carry yellow fever-smitten passengers into this State, Governor Waterman, with that care for the welfare of the State so characteristic of the man, requested your Board to take such steps as deemed prudent to guard against any possibility of the conveyance of the disease into California. Accordingly at the next meeting of the Board, Dr. S. S. Herrick, of San Francisco, was appointed to visit the southern portion of the State and determine exactly where the danger lay, if any existed. He was also instructed to visit the Mexican ports in contiguity to us, and ascertain whether any yellow fever existed there, and to report at once in accordance with these instructions. Dr. Herrick immediately left San Francisco, and having made the required inspection forwarded the following report:

Dr. G. G. TYRRELL, *Secretary State Board of Health:*

DEAR SIR: Having finished my tour of inspection in the Mexican State of Sonora, and returned thus far to consult with Dr. Orme, I am now ready to continue my report from the date of leaving Los Angeles.

On the night of the fifth instant I stopped off at Tucson, where I met Drs. J. C. Handy, H. Spencer, and H. W. Fenner. Dr. Handy is the local surgeon of the Southern Pacific Company, and was formerly an Assistant Surgeon in the United States Army. He testifies that cases of yellow fever occurred at Tucson in 1883, 1884, and 1885, but no case originated here, all having sickened, or contracted the disease, before arrival. He believes it impossible for the fever to obtain a foothold here, so as to spread, on account of the altitude (2,390 feet), cool nights, dry air, and distance from the sea. Dr. Fenner believes there is no danger of yellow fever effecting a lodgment here, on account of the altitude and distance from the sea, but thinks an inspection station should be established on the border to prevent the introduction of yellow fever and smallpox from Mexico, which might even reach Los Angeles. He instanced an opera troupe which suffered from yellow fever severely at Hermosillo, in 1885, and came to Tucson with all their effects. No disinfection of their baggage was made, and yet no yellow fever followed. Most of the cases at Tucson were railroad employés, who contracted the fever in the Mexican State of Sonora. No permanent resident of the town has it.

Dr. Spencer mainly confirmed the above statements and views, but believes that yellow fever might become epidemic at Tucson, provided it gained a firm foothold; it would be dangerous to introduce a large number of cases. He does not consider the nights cool enough to prevent the spread. (At present the daily range of temperature at Tucson is about 58 degrees to 92 degrees.) In 1884, he states that the Southern Pacific Company established an inspection station a few miles east of Tucson, to guard against yellow fever from Sonora and the Rio Grande region. There trains halted and passengers were examined.

Dr. Handy states that smallpox has occurred frequently at Tucson, but mostly among the Mexicans and Indians. At present there is none at all.

On the train from Benson to Nogales, October seventh, I made the acquaintance of the General Superintendent of the lines from Benson to Guaymas, Mr. H. T. Richards. He stated that yellow fever reached Nogales in 1883, 1884, and 1885, from Guaymas. No cases originated at Nogales. The fever died out late in 1885, and none has existed along the lines since. Most of the freight going north by the railroad consists of ores from the mines of Arizona and Sonora. Some dry hides, not exceeding thirty carloads annually, are shipped north, destined for New York and other eastern cities. The conductor of the train stated that Messrs. Rosenberg & Metzler have warehouses for hides at Nogales and Benson. From another source I learned that most of the hides from Sonora are shipped at Guaymas to go by sea to San Francisco. Drs. Gregory and Goodwin, of Nogales, agree in the statement that no cases of yellow fever have originated there, though a good many occurred in 1883, 1884, and 1885. The altitude of Nogales is three thousand eight hundred and sixty-nine feet above the sea. Its daily range of temperature at present is from 50 degrees to 55 degrees, to above 90 degrees. Snow and ice occur every winter. Last winter it was unusually cold, and the lowest temperature was 14 degrees.

At Hermosillo, capital of the State of Sonora, I had interviews on October ninth and tenth with Messrs. Belisario Valencia, Private Secretary to the Governor; Mr. Calderon, a merchant, and in 1883 member of the Sanitary Board; and Doctors Monteverde and Aguilar. Their concurrent testimony is that yellow fever reached here in 1883 for the first time, coming from Guaymas. There was some disposition on the part of the Health Board, said Mr. Calderon, to quarantine against Guaymas, but the influence of the latter city caused the idea to be abandoned. The fever reappeared in 1884 and 1885, but was successively less prevalent and less severe, and there has been none since 1885. Very few of the population who remained escaped an attack. Even the Yaqui Indians showed about the same susceptibility, but had it with less severity than white people. Mr. Calderon states that the Chinese escaped entirely at Hermosillo.

In 1887, a very mild but sweeping febrile complaint called "sardina," prevailed at Hermosillo. The fever lasted two or three days, was attended with severe pains in the head, back, and limbs, frequently with a cutaneous eruption, and sometimes a relapse. I have no doubt that it was the same disease known in the Atlantic and Gulf States of the South as "dengue" or "break-bone fever."

There has been no smallpox at Hermosillo for two years, but diphtheria exists to some extent. Asiatic cholera prevailed along the west coast of Mexico and reached Hermosillo in 1850, lasting until 1851.

Dr. Monteverde believes that some cases of yellow fever in 1883 originated at Pesqueira, a railroad station twenty-four miles north of Hermosillo, but that this was the extreme northern point of possession by the disease. It declined in severity and prevalence each successive year, until its final disappearance in 1885. Dr. Monteverde was supplied by Dr. Carmona, of the City of Mexico, with his virus of the supposed microbes of yellow fever, and used the same hypodermically in the late visitation; but he found no advantage either in the prevention or mitigation of the disease.

Hermosillo has a population of about eight thousand, is ninety miles north of Guaymas, and six hundred and eighty feet above the sea. In winter there is usually some light frost. Last winter it was cold enough to injure the new growth of young orange trees and cause a fall of the leaves. The water is derived from wells, about eighty feet from the surface, and has a saline taste. Most of the rain in Sonora falls in July, August, and September, but this year none has fallen since August, and a severe drought is apprehended.

At Guaymas most of my information was obtained from Dr. P. Figueroa, who is at the same time Mayor, Health Officer of the Port, Physician to the City Hospital, and Surgeon to the Railroad Company, besides being a private practitioner, consulted far and wide.

All vessels from other ports are visited, and if from infected ports, or coming with contagious disease aboard, are subjected to detention of ten days for observation. There is no quarantine establishment prepared to disinfect vessels and their cargoes; no facilities for transhipment of cargoes. Passengers might be landed and kept under observation in tents ashore, about six miles from the city.

There is no direct communication between Guaymas and the Isthmus. Pacific Mail steamships come to Mazatlan. The steamships "Newbern" and "Alejandro" connect Guaymas with the Mexican ports on the Pacific, and with La Paz on the Gulf of California. Freights to Guaymas from Mexican ports further south consist chiefly of coffee in sacks, manufactured cottons, soap, and sugar.

In August, 1883, the Pacific Mail steamship "San Juan" brought goods from Panama to Acapulco, Manzanillo, San Blas, and Mazatlan, and passengers from San Blas to Mazatlan. Yellow fever soon broke out at Mazatlan, and almost immediately at Guaymas, and soon extended from the former to San Blas, Manzanillo, and Acapulco. The infection is supposed to have been brought to Guaymas and La Paz by the steamship "Newbern," which landed passengers and goods from Mazatlan—some of these passengers having come on the "San Juan" from San Blas to Mazatlan, on which vessel they probably contracted the fever. This was its first appearance, I am informed, on the west coast of Mexico since 1836, when it existed at Acapulco.

Being a strange disease, its nature was not at first recognized nor its proper mode of treatment understood. Its spread was rapid, and most of the population of Guaymas had it in 1883, with no exemption of age or race. Even the Chinese at Guaymas had the fever, but none died. Natives suffered far less than strangers from Europe and the United States, and less than natives of Sonora outside the city. The estimated ratio of mortality, taking all classes for the three years, was 5 per cent, which is unusually low. During the season of 1885 it seemed to die out, partly for want of subjects and partly from diminished activity of the infection.

Since 1880 a fever, variously called "sardina," "tonto," and "alfombrilla," has several times prevailed at Guaymas. It is supposed to have been introduced from Mexican ports further south. The description answers clearly to the well known "break-bone fever" of the southwest.

For two years the Central Mexican Government has been giving the local authorities information of infectious diseases occurring either in foreign countries or in any port of the republic. By means of the international code of signals, a vessel from an infected port is made out from the lighthouse at Cape Haro, nine miles from the city, and can be ordered not to come inside the harbor. There is telegraphic communication along the coast from Guaymas to Mazatlan, San Blas, and other Mexican cities southward, so that they could be warned of the existence of danger at any other point; and Dr. Figueroa has promised to give the State Board of Health of California timely warning of danger on the Mexican coast, whether in the shape of yellow fever, cholera, or smallpox. On the other hand I have promised that he shall receive the monthly reports from your office and from the Health Office of San Francisco, as well as warning of any imminent danger from infectious disease. Here it is important to remark that during the whole course of smallpox at San Francisco in 1887 and 1888, even when proclaimed as epidemic by the Health Department of the city, the steamships "Newbern," "City of Topeka," and "Montserrat" brought clean bills of health from San Francisco to Guaymas, as I was informed by Dr. Figueroa.

In 1885 and 1886 smallpox existed at Guaymas, but there has been none since.

Dr. Figueroa has used the inoculation of the supposed virus of yellow fever for its prevention, according to Carmona's method. The urine of a yellow fever subject is concentrated by evaporation, without heat, and when needed for use is diluted with distilled water, without being precise as to strength. The dose is 15 minims, by a hypodermic syringe. Sometimes the result was an abscess, with no other effect. Ordinarily there followed fever for two or three days, with moderate headache and backache. The experiment was tried on about one thousand soldiers, who were soon ordered to march to the Yaqui district, and it was impossible to trace up the results. Dr. Figueroa believes that a portion thereby obtained immunity, but those attacked enjoyed no advantage in mildness of the attack. As to prevention, this must be quite conjectural, for they might have escaped without the inoculation.

The population of Guaymas is about five thousand, and is believed to have diminished since the appearance of yellow fever in 1883. The water supply is derived from wells forty to fifty feet in depth, just outside of the city, which is brought in small tanks on wheels, and in leather bags on the backs of donkeys. It is saline to the taste. The railroad company have a limited supply from wells at a greater distance, pumped into a reservoir and piped to their buildings. There are no sewers. Privy vaults are emptied at night by open vessels, in primitive fashion. There is no systematic inspection of premises. Complaints of nuisances may be made to the police authorities.

In ordinary winters there is no frost, but last winter there was a little ice. At the present time the daily range of temperature is from about 80 degrees to 94 degrees.

Respectfully your obedient servant,

S. S. HERRICK, M.D.,
Special Inspector.

As the report of Dr. Herrick indicates that there is no danger this year from any inroad of yellow fever from Mexican towns adjoining our boundary, the President did not think it necessary that a visitation should be made farther down the coast. Dr. Herrick is, however, of the opinion that hereafter it will be necessary for us to ascertain the condition of those Mexican ports that are in close communication with us by sea, as yellow fever is endemic among them, and even when developed it is almost impossible to ascertain the truth from the shippers, or even the inhabitants.

During Dr. Herrick's visitation south it was ascertained that the shipment of nursery goods, such as plants, trees, etc., did not take place from Florida until February and March, when they had been exposed to the frosts that are supposed to destroy the fever germ; hence no danger is to be apprehended from this source. The approach of winter will remove all danger from passenger travel, and all trains up to that time will be closely watched to prevent any fever-stricken passengers from entering the State.

CONTAGIOUS DISEASES AMONG ANIMALS.

The attention of the Board is called to the prevalence of contagious diseases among cattle, which exist in some parts of the State. Splenic fever, anthrax, and actinomycosis are among those affecting the cattle, and glanders the horses, and as such diseases are particularly dangerous to human life, the desirability of making some provision for the investigation of such cases is apparent. This can best be done by the appointment of a State Veterinarian, who shall have authority to investigate into the presence of such diseases, and take the requisite steps for the restriction and control of such animals as may be found affected by contagious maladies. A law to this effect should be immediately passed, containing among its provisions one for the partial compensation of those whose horses or cattle it may be necessary to destroy, as their destruction otherwise would involve the State in endless litigation. The law should also provide that the appointment of this veterinarian should devolve upon the State Board of Health, which would remove it from the arena of politics, and insure the appointment of a man for his superior qualifications, and not for his political affiliation. He should be compensated while in the actual service of the Board, and be required to visit at any time any county suspected of containing diseased animals, and report immediately to the Board.

As confirmatory of these remarks, we will here append a letter from Dr. Herrick, as supplementary to his report on yellow fever. Dr. Herrick had been instructed by this Board to make diligent inquiry into the question of cattle disease in California, with a view to our Board urging the necessity of some legislative action in the premises if a sufficient cause therefor existed. By this report your Board will see that disease among cattle does exist in California, and that the sooner a State law is enacted for the proper inspection of the food-supply of our people, the quicker will be the removal of many diseases, the source of which has hitherto remained unsuspected:

Dr. G. G. TYRRELL, *Secretary State Board of Health:*

DEAR SIR: Continuing now from the end of my previous report, I would say that Dr. Joseph Kurtz, of Los Angeles, on the eighteenth instant informed me that he treated two fatal (walking) cases of yellow fever at the Sisters' Hospital in August, 1885. They had been in the State of Sonora, Mexico, on business, and sickened before arrival at Los Angeles.

Dr. Orme is of the opinion that in case an inspection station is to be established on the Southern Pacific Railroad in the direction of Yuma, the proper place would be Cabozon, one hundred and fifty-six miles northwest of Yuma, and about one thousand seven hundred feet above sea level.

October twentieth a butcher of Los Angeles stated to me that cattle affected with bloody murrain and Texas fever had come into the city within a few weeks, but there were none at present. It is to be noted that he wished employment in looking up diseased cattle. This is the only hint of such a thing about Los Angeles. This city has no public abattoir and no meat inspector.

In an interview with Dr. R. W. Hill, of San Pedro, October twentieth, he stated that he had made to Dr. Orme an offer to inspect, without charge, all vessels arriving at this port, if authorized to keep boarding-house runners from first visiting them; and he would report to the State Board of Health all contagious disease found aboard. He could undertake the care of cases of smallpox, if desired. The danger is from small sailing vessels—coasters. There were sixteen deep water ships at this port the previous week, and eighteen the week before. Dr. Hill had heard of no diseased cattle in that vicinity. There is no smallpox at present, but there were some cases six months ago.

Going ashore at Santa Barbara on the evening of October twentieth, I communicated with Mr. W. R. Broome, a large dealer in cattle. He stated that there was, some time ago, a small amount of disease among the cattle of Ventura County. At present he hears of none there nor at any place south of San Luis Obispo, but hears of some in this last county. Mr. Broome always quarantines newly purchased cattle before mixing them with his other stock. He would be glad to receive circulars of instruction from the State Board of Health relative to the treatment of diseased cattle.

Mr. I. K. Fisher, a cattle dealer of Santa Barbara, states that no disease has existed among the cattle of this county for several years. About twelve years ago the Texas fever was introduced by cattle driven from that State through Sonora and Arizona, and has existed here and there most of the time since. It is rapidly fatal, and is the disease most dreaded by stock men. "Blackleg" was introduced about three years ago, from some quarter unknown to him. It affects the limbs from the foot upward with enormous swelling. It has been treated by the hypodermic injection of some nostrum. "Pink-eye" has also prevailed to a limited extent since two or three years ago. He is ignorant of its origin.

At San Luis Obispo, October twenty-first, I met Mr. C. J. Bromley, who has a cattle ranch seventy-five miles to the eastward. He has observed four or five cases of "big-jaw" (*actinomycosis*) among his herd of about one thousand cattle. It has existed two years, but he has lost no cases. Has not separated them from the others. Intends to kill them.

Mr. E. Baker, a cattle dealer living at San Luis Obispo, knows of no disease among cattle in this vicinity at present, and has heard of none for a year, though he spends a great part of his time among the ranches. He has not heard of any such trouble in Monterey County.

At San Francisco, October twenty-second, in company with Dr. Thos. Bowhill, V.S., now in the service of the City Board of Health, I visited several dairies on Mission Street, and afterwards the slaughter houses at Butchertown. No diseased cattle were found. It is generally admitted that the condition of beef cattle has improved since Dr. Bowhill went on duty, ten days ago.

Some butchers deny that any diseased cattle have been slaughtered and sold here for food; others admit the fact, particularly as regards "big-jaw." All maintain that no diseased cattle are brought here at present.

October twenty-third I accompanied Dr. Bowhill in a visit to several dairies beyond the thickly populated part of the city. Among the cows of four dairies we found four cases of "actinomycosis" well marked, three less marked, and one case of advanced tuberculosis.

October twenty-fourth I visited a number of pork shops in Chinatown, in company with Dr. Bowhill. We found many lungs and livers tuberculous, and one case of hydatids of the liver. All these organs were condemned and destroyed, but it is obviously impracticable to discover all that come to Chinatown, or that are elsewhere offered for sale.

Large numbers of hogs belonging to butchers and to Chinamen are fattened on the offal of slaughtered animals at Butchertown. They are kept in close, dark, and filthy pens underneath the slaughter houses, and fed on offal for six to twelve months before they are killed. Most of them become sick, when first put under these conditions, and a good many die. It is not strange that the viscera of such hogs become diseased, and it is clear that pork fattened in this way is not a desirable article for human consumption, whether the viscera be healthy or not.

My visit to Petaluma was occasioned by reports of diseased cattle there, and of the shipment of tuberculous cows from the city to that place, for concealment. On arriving there, October twenty-sixth, I called on Mr. William A. Lewis,, who lost five cows out of about forty in the early part of September. They were fed on green corn and the stalks, which had previously been chewed dry by hogs. All that sickened died in about eight hours. After withdrawing the corn no more sickened. Then the hogs were separated from the cows; corn was again given, and no more cows sickened. There was no disease among the hogs.

Dr. Thomas Maclay, V.S., who has resided three years at Petaluma, confirmed the account of Mr. Lewis. Post-mortem examination of the cows showed impaction of the dry cornstalks in the third stomach and inflammation of the cerebral meninges. His explanation is, that the impaction and irritation of the stomach by the sharp points of the cornstalks caused reflex action upon the cerebral meninges and death with head symptoms. About three months ago he saw at a dairy a solitary case of actinomycosis, which was destroyed, by his advice, and the carcass was buried. He heard of two or three other cases at a certain dairy about two months ago, but did not see them. He has heard of no other cases of contagious disease among cattle. Liver-fluke has prevailed among sheep feeding on wet grounds in this valley, and considerable numbers have died. Their carcasses have been left to the buzzards.

Dr. Maclay is a regularly educated and well qualified veterinary surgeon; is very obliging, and greatly aided my investigations.

Dr. J. H. Crane, President of the Board of Health of Petaluma, states that several individuals here have been in the habit of buying up bulls and old broken-down cows of dairymen. Some have been shipped alive to San Francisco, and others after slaughtering; but none have been purchased lately. This practice is probably the foundation of the report that diseased cattle were supplied to the butchers of San Francisco from Petaluma.

A gentleman who owns a dairy ranch in the vicinity stated that it is customary for dairymen to send their old cows, just before or just after calving, to the city, to be disposed of. They fall into the hands of city dairymen, are milked for one season, and then are sent to the butcher.

The man who attends to the shipment and receiving of freight, at Petaluma, for the steamer "Gould," informed me that no diseased or broken-down cattle have been shipped to the city for the last three months, though this has been practiced. No such cattle have been received by boat from San Francisco.

It can only be conjectured how many of these old cows are tuberculous. It is certain that their conditions for health are more favorable in the country than after their arrival at the city.

At San José, October twenty-ninth, H. A. Spencer, V.S., stated to me that anthrax appeared in a certain dairy two miles from that city, in 1885. Fifteen cows were lost, and the remainder were removed. Some hogs also died, after feeding on their carcasses. The origin of the outbreak was unknown. It was confined to an inclosure of about one hundred and fifty acres. No disinfection of grounds or shed was made, but the place has not been used as a dairy since. Dr. Spencer attended a horse which died of anthrax about September first, near the New Almaden mines, about ten miles from the Tennant ranch. He conjectures that the contagion might have been conveyed from the latter place in bones carried off by coyotes. He has met a few cases of actinomycosis during the last ten years, and one animal thus affected was destroyed a few days ago. In his opinion the recent action of the State Board of Health had produced a marked impression on owners of stock. Dr. Spencer has been the Official Veterinarian of Santa Clara County since

May last, and up to the present time has caused twenty cases of glanders and farcy to be destroyed.

October thirtieth I met a gentleman at San José from Tennant's Station, who reported the sudden death of another of his horses, being the fifth since September twenty-sixth.

A son of Mr. James P. Sargent, of Sargent's Station, informed me October thirtieth that his father lost about thirty-five cattle out of three hundred during the month of September, while pastured on a certain field at Tennant's Station. The cattle were then driven home, where five more died. That particular field of seven hundred acres at Tennant's he stated to have had a history of fatality to cattle for fifteen years. The disease prevailing is undoubtedly anthrax.

Mr. Samuel Rea, living near Gilroy, stated that he has lost thirty-five out of one hundred milch cows during the present season, from a disease which he has not known among them before. They died within a day or two of the onset, or recovered under a purgative treatment. His nephew stated that a disease known as "bloody murrain" had prevailed among the cattle belonging to his father and himself for the last twenty years, when pastured on a certain marshy field of two hundred and fifty acres, two and a half miles from Gilroy. Cases have also occurred in two other fields, wet in winter only, for many years, but not constantly. Their cattle never die this way when kept on the mountains. At least one hundred and fifty of their cattle have been lost in three years, and very few of those attacked recover. One of his neighbors has also lost a few cattle in a similar way.

At Monterey, October thirty-first, the foreman of Hon. B. V. Sargent informed me that a disease called "blackleg" has in former years destroyed a few of the best calves on the ranch, about five miles out, but none have died this year.

Mr. David Jacks stated that he has annually lost a few calves and yearlings of the same disease, which he attributes to plethora, as it attacks animals in the best condition, and may be prevented or relieved by bleeding and purging.

At Salinas, November first, several individuals testified to the annual prevalence, for a number of years, of a disease called "blackleg," on a field of six hundred acres three miles out, traversed by the Salinas River, which is cultivated in barley. It is therefore pastured only about three months after the removal of the crop. The owner stated that *a few* cattle had died on it this year—twenty-two out of six hundred. The survivors were removed early in October, and no more had died. He also stated that there are now about eighty horses on this land, none of which have died; though in 1885 seventeen out of thirty horses recently brought from the mountains had died there.

Dr. Tuttle, of Salinas, has made a number of post-mortem examinations of cattle dying on this tract, and in every instance he found the spleen enormously enlarged and softened. One of his fingers bears the scar of malignant pustule contracted in this work, and he relates a much more serious case treated by him.

I remained at Gonzales three days, investigating the malady which has prevailed there for years, in conversation with many individuals. It appears that a disease called "blackleg," or "bloody murrain," has annually occurred on a tract of eleven thousand acres since 1876. The land has been cultivated in wheat and barley since 1874 or 1875, and one individual stated that the disease appeared before grain grew there. It first made its appearance along the river, which forms the western boundary, has gradually extended eastward across the valley, and within the last two years has invaded the foothills. The general opinion is that the disease is confined to this tract, though there is some testimony to the effect that the tracts on the north and that across the river have been reached. Its prevalence is confined to the periods of pasturage upon the stubble, August, September, and October, and at the time of my visit it had about ceased. Sheep had suffered so severely that none had been pastured there for two years, and this year more cattle and horses had died than ever before. Hogs and dogs feeding on their carcasses had also died. One herd of cattle, numbering one thousand eight hundred, had lost over one hundred. Another of nine hundred, had lost nearly eighty in a month. The survivors were then removed to another stubble field three or four miles further south and stopped dying.

I conversed with two men of Spanish descent, who are in the habit of skinning these dead animals and of helping themselves to as much of the flesh as they choose. They and their families eat it both fresh and after drying, and large quantities of this meat are jerked. In all probability a portion is sold for consumption by people ignorant of its origin. These persons claim to suffer no harm in their own persons or families from such practices. A physician has reported the death of fourteen children in 1884 as attributable to eating such meat, but it is assigned by others to diphtheria. Previous to this year the carcasses were left on the ground, but lately the remains have been burned after skinning.

It was my intention to make one or more post-mortem examinations of dead cattle at Gonzales, but none died after the first day of my three days' stay. The stubble was then nearly exhausted, the cattle were about to be taken off, and the disease was substantially over for the season.

Mr. Mercer and Dr. Bowhill brought away morbid specimens from a previous visit, and submitted them to the examination of expert microscopists in San Francisco, who clearly made out the destructive bacilli of anthrax.

At Salinas I met the partner of Mr. Breen, who lost nearly six hundred cattle out of a herd of thirteen hundred, on a certain ranch near Soledad, during the last ten days of September. It was a rented pasture, and is said not to have had diseased cattle on before this year. Mr. Breen hastily removed them to another tract not far off, and no more sickened. The few that were sick at time of removal died. The disease is said to have been Texas fever. If so, I know not how it was introduced. It was my intention to clear up this point, but the investigation is here arrested.

The public mind has been greatly exercised of late by reports of diseased cattle, and the demand for beef has considerably diminished. This has been felt by owners of beef cattle, and I found them disposed to speak of "blackleg" as by no means a formidable disease nor more prevalent this year than formerly. Dairymen freely acknowledge their losses, and those not interested in stock raising speak without reserve on the subject. I am satisfied that anthrax is more widely distributed in California than is generally supposed by the public, and that the owners of beef cattle are reticent on the subject. The first step toward applying an effectual remedy is to obtain the facts. Then some legislation may be needed to strengthen the authorities, so that the contagion may be eradicated. It is necessary that the poisoned fields should be thoroughly burnt over, and where the disease has long prevailed, this should be repeated the next year and perhaps the following one. Where the land is cultivated in grain, the stubble can easily be burned as soon as the crop is removed. Where grass alone grows there will be some difficulty, but the richest lands, producing most pasturage, are those most poisoned. At the present writing, November seventh, the excitement has mostly died out, but the subject should not be allowed to rest. The Legislature should make it the business of one or more competent men to learn what fields and buildings are infested with the anthrax poison, and make it the duty of some authorities, State or local, to attend to its eradication. The longer the matter is delayed, the more the difficulty will grow, and at the same time the more urgent will become the necessity for efficient action.

Respectfully submitted.

S. S. HERRICK, M.D.

OUR CORRESPONDENTS.

The increasing number of those to whom we are indebted for means to enable us to furnish this report is so great that it is only through this report that we have the opportunity of thanking them individually and collectively for the very valuable information supplied from time to time to this office. We have particularly to thank those physicians who have so generously furnished us with circumstantial accounts of outbreak of disease in their practice, or under their immediate supervision, and with accounts of investigations that have been made with reference to the causation of sickness, and their modes of prevention. We desire to say that all such communications are received with great pleasure, and are utilized in giving expression to the sanitary lessons which such descriptions teach. We trust in the coming years to still further increase the area of our correspondence until the State Board of Health will be in intimate relation with every town and village in the State, through its local health authorities, or its medical friends. Suggestions from any such, whereby the efficiency of the Board can be increased, or its work extended, will always be welcome, and to those who have given us such efficient aid in the past, and hope will continue with us in the future, we again tender our heartfelt and sincere thanks.

To those gentlemen who have contributed so liberally to the literary portion of our work the Board also desires to express its thanks. Some very valuable papers will be found in our appendix, from writers of national reputation, which will be perused with much pleasure and a great deal of profit.

Our thanks are also due to the Signal Service Corps for meteorological observations, and to Sergeant Barwick, of this city, for a contribution on the climate of Santa Barbara as compared with Mentone and San Remo. The aid which the Signal Service is rendering in determining some problems in the causation and cure of disease is becoming more apparent every year.

THE PRESS.

We are happy to say that the cordial relations which existed between the press and our Board, when its last biennial report was printed, still continues. To its aid we owe much of the success which now attends the Board in its advisory capacity. Although perhaps some apparently just criticisms have been made upon the reports promulgated through our "Monthly Circular," these were made by those who failed to understand the difficulties under which the Board labors to get any reports concerning the death rate, or the amount of prevailing sickness. The chief fault found with us is in estimating population, and the relative mortality. To these critics we would reply that the population is estimated by the Health Officer or private correspondent, and this Board has no right, having no more correct knowledge, to question the truth of such estimate; neither has your Secretary any right to question the correctness of the deaths reported. When the whole press will aid us in passing such laws as will insure the registration of every death and birth, and in the power of its might compel our legislators to give ear to the requirements of our Board to make it of practical benefit to the public and the State, then if any dereliction of duty occurs, we invite the censure of the press whenever the fault occurs in us, and not in the law under which we act.

As a Board we desire to express gratefully our thanks for the valuable aid the press has always given. The public may thank it in helping us to get an appropriation set apart by the Legislature whereby we were enabled to guard our State against the inroads of disease. Through its instrumentality we were successful in securing quarantine stations in San Diego and San Francisco, and to the press we owe the general diffusion of sanitary knowledge throughout the State that, unaided, this Board could not hope to have known under its present restricted power.

We are now entering upon that era of the world's history when men are becoming convinced everywhere that health and longevity must be governed by laws which are inexorable, and that those who would enjoy perfect health must render implicit obedience to these laws. In the dissemination of this knowledge our Board is engaged, and, sustained by the press, there can be no retrogression. Preventive medicine will be taught the coming generation, until no man will be considered as skilled in the medical profession who cannot alone cure, but also prevent disease.

CONCLUSION.

In concluding this report, as executive officer of the Board I desire to acknowledge, with thanks, my personal obligations to my co-laborers on the Board, for the assistance they have rendered me in the discharge of my duty, and for the counsel cheerfully given in every emergency. Our actions have been harmonious in seeking the welfare of the State, and we think our past acts will merit public approval. We will, in a brief summary, recount our hopes for the future:

First—We look to our Legislature to continue the Contingent Fund set apart for the use of the Board in restricting or preventing the importation or development of infectious or contagious diseases in California.

Second—We trust to have our health laws so amended that we can have a correct return of the births, deaths, and marriages occurring every month.

Third—We hope to have a law passed making it compulsory to have vaccination successfully performed before admission of any pupil into the public schools.

Fourth—We hope to obtain a law forbidding the interment or cremation of any human body within the State without a proper permit. This we ask to prevent and to detect crime, to insure correct statistics of death, and to have a reliable record for reference, whereby those whose identity is sought to be established, by anxious friends or for legal purposes, can be obtained.

Fifth—We hope to make compulsory the organization of local Boards of Health in every county and city in California, that in time of great sickness, or in the advent of an epidemic, unification of purpose may be obtained and concert of action had with promptitude and without conflict of interests.

Sixth—We hope to enact a law creating the office of State Veterinarian, whose duty it shall be to take cognizance of all infectious or contagious diseases among domestic animals, condemn them to death when necessary, and prevent the distribution of diseased meat among the people. We are aware that this source of disease is more common than is supposed, and should be made the subject of judicial inquiry. We also will recommend that the Legislature make provision for a small payment in recompense for the animals slaughtered.

Seventh—We will ask the Legislature to vote a small appropriation to enable this Board to have the mineral springs of the State officially analyzed.

These are the chief requirements of our Board, and we would ask our legislators to reflect upon these subjects, and be prepared to vote intelligently upon the propositions. They are all in the interest of the public health, and for the lasting benefit of California.

We append to this report the reports of the committees appointed to visit those institutions drawing aid for their maintenance from the State; also the report of the State Analyst, together with whatever reports we have received from County Hospitals, which are, we regret to say, meager in the extreme. Appended to this report are the expenses of the Board and expenditures for quarantine purposes, vouchers for which are on file in the Controller's office. We also append the names and addresses of our various correspondents, to whom we are indebted for the mortuary statistics that immediately follow; and although, through the inefficacy of the law, they are neither full nor complete, yet they give the public an adequate idea of the general freedom from disease which characterizes California, and impresses the visitor from abroad with a sense of how favorable the climate must be that produces such a limited mortality from climatic diseases.

All of which is respectfully submitted.

GERRARD G. TYRRELL, M.D.,
Permanent Secretary California State Board of Health.

REPORT OF THE STATE ANALYST.

Pure air, pure water, and pure food are essential to the maintaining of health. Whoever introduces impurities into either of these substances may thereby introduce disease and death. The position of the individual citizen in this regard is one of utter dependence and helplessness. The air may be infected with disease germs, but he cannot perceive them—they are not recognizable by either sight, or touch, or smell. The ordinary person cannot discover them by any sense; polluted water may have the appearance of pure water, it may be clear, and cool, and palatable, and refreshing to the taste, and still contain the seeds of disease; food articles may have all the appearances of purity, the dealer himself may believe them pure, and yet they may be adulterated, and even dangerously adulterated. It is clear then that in these matters the State must protect its citizens, because of their inability to protect themselves. This right and duty is conceded in every civilized country. We maintain a rigorous quarantine against infectious diseases, we condemn property, we compel the removal of business, we require every person in the community to avoid the maintenance of a nuisance. The State cares for the water supply and protects it against pollution. In this connection, it should be remarked that everywhere throughout the whole civilized world, greater and greater care is being exercised in this matter, and stricter laws enacted. Two years ago the Legislature of Massachusetts appropriated $30,000 to the State Board of Health, for the purpose of a thorough examination of and report upon the water supply of the State.

The food question stands very much upon the same basis. The consumer cannot detect adulterations in the food he eats; he cannot with any certainty detect adulteration in the crude materials as he buys them in market. The dealer himself, with all his knowledge of the business, is very often deceived; both consumer and dealer are alike helpless; they alike turn to the State and ask, yea, demand protection from the frauds and dangers which threaten them at the hands of unscrupulous manufacturers and dealers. No argument is needed to prove that the citizen has a right to this protection or that the State is bound to furnish it. This is conceded in all countries and by all nations.

Very active and vigorous and effective measures have been taken by nearly all civilized countries for the complete suppression of trade in adulterated foods, drugs, and beverages. Public attention has been specially called to this subject during the last ten or fifteen years, and it has been during this short period that the most effective efforts have been put forth to stop the manufacture and trade in adulterated food and drugs. If less attention has been called to the subject on this coast, the reason has been that we are pressed with many other problems incident to a new and isolated State. The movement in the East has been slow when compared with the States of Europe. We are so accustomed to let things take care of themselves and so careful not to interfere with the business of the country, that we have almost hesitated to follow the examples of our neighbors on the other side of the Atlantic. We must appreciate the necessity for legislative action before any can be taken. Massachusetts was among the first of the Eastern States to take action on this subject, and after a personal study of their laws and methods, in my opinion, they are the most efficient. I believe that we would do well to be guided by their experience and to follow their example. Food adulteration is a great and growing evil, yes, it is a fraud and a crime committed upon innocent and helpless victims. As a State and community we shall fail in our duty to ourselves and to our neighbors if we do not take an active interest in this matter, and see to it that adulterators of food do not go unpunished.

The adulteration of food is not altogether a new thing. It has undoubtedly been carried on to some extent before our time, but not on so large and grand a scale. An unscrupulous dealer may now and then have attempted to deceive his customers, and increase his own gains, but such dealers were rare, and their attempts at adulteration were clumsily done. We have all heard the story of wooden nutmegs in Connecticut, and that now and then sand had been added to sugar, but no one ever believed that the practice was common, if, indeed, there may have been some truth to start the story. It was left for our time to raise the adulteration of food to a fine art. No one country and no one locality seems to have attained, certainly not to have maintained, a monopoly of this art for any length of time. I know of no contagion that spreads so rapidly and surely. Apparently it reaches all countries and all peoples—at least, those claiming to be civilized.

Adulterations affect the public in a twofold manner; they affect the commercial interests of the country; but this, and of far greater importance, they affect the health of the country. There may be adulterations which do not seriously affect health, but they are nevertheless frauds, and their influence, though felt chiefly in the commercial relations of our people, is baneful. We should not forget that every fraud has a moral effect upon a community, and when countenanced in any way, its influence is widespread and disastrous. It is for this reason, if for no other, that we cannot be indifferent to any adulteration, whether prejudical to health or not. As a general rule we can leave the solution of purely commercial problems to those most directly interested. Large interests, when interfered with, can usually protect themselves. Combination and association have become so general in our day that the weak individuals are easily transformed into an invincible organization.

The New York Dairyman's Association was able to procure legislation based wholly upon the fact that the manufacture and sale of oleomargarine was prejudicial to their interests. They were right when they denounced its sale under the name of butter. It was not pure butter, and had no right to be called butter, or sold as such.

The adulterations of olive oil and of lard come under this same class. No one claims that they necessarily are injurious to health, but they are being sold for what they are not. It is a safe rule to establish, that every article which does not show what it is, upon simple inspection, shall be labeled correctly and intelligently. If the lard refiners can make an article which is as good, or better, than the pure lard, they are entitled to all the benefit which they can derive from their study, experiment, and skill in manufacture. There may be a legitimate field for investigation and enterprise in this direction.

When Liebig, in 1865, recommended a food for infants, he conferred an incalculable blessing upon coming generations. His profound knowledge of chemistry, and of plant chemistry, and of animal chemistry, enabled him to recognize a substance which could replace mother's milk. There is a vast field for the application of chemistry to the *improvement* of food, but it ought not to be directed to its *adulteration*.

There is a debatable ground which perhaps should be mentioned. It is one of the triumphs of modern chemistry that a very large number of substances occurring in plants or animals, or extracted or derived from them, have been prepared artificially in the laboratory. Now in very many cases this artificial product is *absolutely identical* with what we may call the *natural product*. I can illustrate by taking certain coloring substances. Alizarine has from time almost immemorial been extracted from the madder. Graebe and Liebermann, two German chemists, prepared it artificially from the coal tar products. The artificial and the natural drugs are absolutely identical, and it is now a matter of but little consequence whether the method of preparation be given or not. Indigo is prepared artificially and is identical with the natural product. Salicylic acid is prepared artificially and I think it is now conceded that it may replace the natural. Perhaps extra care may be needed to insure equal purity. I think it would be no fraud to use the artificial in place of the natural acid. This is an extreme case, yet a clear rule it seems to me can be laid down. The *proof* must be furnished and accepted by the highest authority, and I would add by *official authority*, that the artificial and natural products are the same.

In pharmacy we have the Pharmacopœia, which is the official authority, or rather is accepted as such. In the great majority of cases, however, there will not be found any such debatable ground. In the case of food, which is almost always a mixture of many chemical substances appropriated and organized into a structure under the influence of plant and animal life, we may not expect to reproduce it artificially. The spirit which allows or prompts adulteration, even if that adulteration is not necessarily harmful, is *hostile* to the best interest of society, and easily degenerates so as to countenance injurious practices.

I shall next call attention to the *nature* and *extent* of adulteration as practiced outside of our State. The evidence will be taken from official reports and official examinations made in the East and in Europe.

By a general consent milk is placed first on our list, and more attention has been paid to this than to any other single item of food. It is the diet of young children and of invalids, as well as of older and stronger persons. If it does not contain the ordinary nourishing constituents in the proper proportion, it is not what the buyer has a right to expect; if, on the other hand, it contains foreign and injurious substances, it is a fraud, and may prove very injurious to those who use it.

The one adulterant of all times and countries and people is water. It is the old, old story, that the milkman will add water to his milk. It is a practice which is begun very gradually, as the testimony in many cases will show. The milkman in pouring from one vessel to another rinses out his can or pail and pours the rinsings into the milk. This only has to be done frequently and liberally to dilute the milk very considerably.

In examining the record, it would seem as though the practice was very cosmopolitan and very democratic. No country and no class can lay exclusive claim to it. The milk is watered in small quantities and it is watered in large quantities, it is watered a little and it is watered a good deal. The only wonder is that the community will allow itself to be so imposed upon. Of the adulterants other than water I will not take time to speak. When water is added in such quantities that taste and general appearance are affected, then other things are added to prevent the ready detection of the watering. Not unfrequently, according to these reports, the milk is skimmed or partially skimmed. The addition of preservatives is not as common as it was a few years ago. For this purpose boracic acid and salicylic acid were used. I shall speak of these in connection with wine, and will now pass them over.

Many and varied are the adulterations that the chemist has to look for, yet few and simple are those usually found in the milk.

The constitution of pure milk has been so thoroughly and carefully investigated that we are enabled to agree upon a standard, and milk which does not come up to this standard is condemned. It may fall below this standard, because it has been adulterated, watered, etc., or it may have been taken from cows insufficiently fed or in a low, lean condition, and if not actually sick, lacking the vigor and strength of health.

All over the world this problem has been met, and the chemist now stands on firm ground and has the support of the communities where he works. I suppose that in no other field has good supervision and inspection accomplished *so many good results.*

In Canada this examination began in 1876, when 58.6 per cent of the *milk examined* was adulterated. In 1886 the percentage of adulteration was reduced to 11.2 per cent. The same or nearly the same result was given me by the President of the Massachusetts Board of Health; it is the experience of milk inspection everywhere. The very fact that there is such an examination by competent authority goes far to prevent adulteration.

I have before me the report of the Inspector of the State of New York:

	Samples.	Adulterated.
In 1880	1,514	11.0 per cent.
In 1881	1,110	4.6 per cent.
In 1882	1,775	6.7 per cent.

The importance of the subject demands attention, and the most careful attention. The testimony from all parts of the world is practically in accord with that from any particular locality. We simply find it a little worse in one place, and a little better in another. Government examination and inspection limits and goes far to break it up.

A supervision of the milk supply of a large city could do much good, as the testimony shows. The supervision means more than a simple chemical examination, for this, once in force, would naturally be extended to an examination of the condition of the cows themselves, whether healthy or not, and especially as to how they are fed. The exclusive use of distillery swill and refuse beets from the beet sugar factory would then be stopped, and many other evils connected with the milk trade would disappear.

I think I may next mention the adulteration of wine, beer, and liquor. I do not refer to local adulterations, for I believe that, taken as a whole, California wine is the purest wine to be had, but even among our people there are some who are tempted to do what is done on so large a scale in other countries.

The following table is taken from the report of the Municipal Laboratory of Paris, 1885, page 173:

	1881.	1882.
Number samples wine analyzed	3,361	5,150
Number samples good	357	896
Number samples passable	1,093	1,590
Diseased wines	6.51%	5.24%
Fortified wines	9.55%	7.32%
Wines not pasteured	24.45%	25.47%
Wines pasteured between 1 and 2 grams	52.53%	41.79%
Wines pasteured more than 2 grams.	23.02%	33.04%
Watered	41.12%	29 15%
Wines colored	15.65%	7.66%
Salicylated	4.73%	5.00%
Salted	.18%	.08%

If we had an analysis of the wines which are being used in the East, I am sure that the honest wine maker and wine dealer would be astonished. Some two or three years ago I received samples of wine which were being sold for medicinal use in some of the best drug houses of the Mississippi Valley. They embraced port, sherry, and catawba wines, specially recommended for medicinal use. A careful analysis showed them to be, beyond all doubt, *manufactured wines*, not made from the juice of the grape, or at most, only flavored with grape juice. We find frequent reports of discoveries by the Health Department of New York of these artificial wineries in the heart of the city where wines are *made*. The materials used are dried apples, dried fruits of the poorest quality, sugar, glucose, grain spirit, etc., with various flavoring substances, coloring matter, etc., to give proper taste and appearance. I believe that the worst adulterations are made in a small way by ignorant and irresponsible persons. It would be impossible to anticipate some of the concoctions which they compound.

I am disposed to speak more fully upon the subject of California wines, because I have had opportunities of knowing a good deal about them. As State Analyst, I have analyzed a large number of wines as they were being marketed. Since the pure wine law went into effect, it has been customary for the wine dealer to require an analysis of the wine to be sure that it was not adulterated before purchasing. As the result of these analyses it will appear that hardly a single wine among the hundreds analyzed was adulterated. I am sure the wines of no other country would show so good a result. There is hardly an excuse for adulterating California wine. Wines are adulterated to cheapen them; they are diluted, and then color and substances to give body and flavor are added, or preservative agents are added (antiseptics, sulphurous acid, or its compounds, salicylic acid, borax, or boracic acid, etc.), or reagents are added to improve taste, color, etc. I think that there is no necessity or excuse for treating our wines in that way. It would be worth everything to us to maintain the reputation of purity for our wines. It is practically conceded to us, and certainly the least we can do is to preserve it. The wine growers are thoroughly in sympathy with this idea, and as a body, I am sure, will heartily support it.

Beer has also been adulterated, and every report of analysts will mention its adulteration. This is most commonly done by substituting some other bitter principle for the hops. Dr. Ure, in Watt's dictionary, says, "as long ago as the reign of Queen Anne, brewers were forbidden to mix sugar, honey, Guinea pepper, essentia binei, cocculus indicus, or any other unwholesome substances in beer." Prussic acid, strychnine, absinthe, and many other poisonous drugs are reported as having been found in beer at various times and places.

The adulteration of distilled liquors is almost proverbial. I will not take time to discuss it here.

I have reason to believe that one of the most adulterated articles to be found in market is the preserved or bottled cider. The attempt to keep any fruit juice like cider or grape juice unfermented, means the addition of antiseptics ninety-nine times in one hundred.

The spices and condiments present special inducements to the food adulterator because of the form in which they are put upon the market.

Instead of the oldtime peppercorn, and allspice, stick cinnamon, and mace, these are ground by large mills and put up ready for immediate use. The modern house servant is far more regardful of his or her convenience than our great-grandmothers, and consequently is more exacting in demanding that everything possible be done for him or her. Nothing is easier than for the spiceman to put in all his dust and waste, and when this gives out to make waste and dust. I am sorry to say that the state of the trade in this branch is most deplorable. The trade is managed as follows: Inasmuch as spice grinding has become a necessity, mills have been erected and maintained for this purpose. They keep spices ready ground, or grind to order. They usually put their own label upon both. The honest and conscientious grocer, who values his good name, says his only protection is to buy the pure, unground article in market and then send it to the grinder, which is returned to him, unless by special agreement, bearing the label of the grinder. Unless I have been very much misinformed, the label which is placed upon these goods conveys absolutely no indication as to their purity. There may be sold, under the same label, goods which are as different as well can be—some pure, some grossly adulterated. As proof of this may be quoted from the bulletin of the Department of Agriculture, by Dr. Richardson, on spices and condiments.

The following advertisements are widely circulated:

> —— ——, manufacturer of spices, spice mixtures, and mustards, 181 —— Street, N. Y. Goods made to order for wholesale grocers and druggists; also grinding done for jobbers who pack their own goods. *Spice mixtures*, cayenne pepper a specialty.
>
> —— ——, 17 —— Street, New York, manufacturer of all kinds of spice mixtures. My celebrated brand of P. D. pepper is superior to any made. Samples sent on application. Goods shipped to all parts of the United States. *Spice mixtures a specialty.* Spices ground for the trade. We are the inventors of suction coolers.

I find in the "Analyst" of 1883 an item which gives us the meaning of "P. D.:" "At the weekly spice sales in Mincing Lane lately, a firm of brokers proceeded to the sale of six hundred and eight bags (thirty tons) of black pepper dust," etc. Objections had been made the day previous to the sale on the ground that it contained 44 per cent of sand and clay. This gives us some hint as to the meaning of "P. D.," which has come to be a well known term in the trade.

The report gives the following statement of the condition of the trade: "At the present time in several of our largest cities the price to be paid for a spice is named by the retail dealer, and he is then furnished from the spice mill with a mixture containing the largest amount of pure material which can be supplied for the money, the necessary weight being made up of a diluent of some cheap and harmless substance, different grades being distinguished as pure, extra, superior, No. 1, no one of which is pure and many of which are mere variations in labels, and none in quality. As example, the fact that a New York firm, it is understood, in a short time used and put upon the market in their market more than five thousand pounds of cocoanut shells, and the quotation already given in a journal devoted to spice milling, shows how universal and open the custom has become."

A comparison of the reports of those States and countries where food examination is maintained, shows that the majority of samples submitted for analysis were adulterated. Pepper is adulterated with starch, rice, yellow corn, and fresh cracker crumbs, and black pepper perhaps more so than white, although the latter might just as easily be adulterated with rice, cracker crumbs, etc.

Spices.	Adulterants.
Allspice	Spent cloves, clove stems, cracker dust, round shells or charcoal, mineral color, yellow corn.
Cayenne	Rice flour, salt, and ship stuff, yellow corn, turmeric, and mineral red.
Cassia	Ground shells, crackers, turmeric, minerals.
Cinnamon	Cassia, peas, starch, mustard hulls, turmeric, minerals, cracker dust, burnt shells, or charcoal.
Cloves	Spent cloves, clove stems, minerals, allspice, roasted shells, wheat flour, peas.
Ginger	Cereals, turmeric, mustard hulls, cayenne, peas.
Mace	Cereals or starch, buckwheat, wild mace.
Nutmeg	Cereals or starch, wild nutmeg.
Pepper	Refuse of all sorts, pepper dust, ground crackers or ship stuff, rice, mustard hulls, charcoal, cocoanut shells, cayenne, beans, bran, yellow corn.
Mustard	Cereals and starch, turmeric, peas, yellow corn, meat, ginger, gypsum.

It is notorious that ground coffee is mixed with chicory and roasted grains. We have yeast powders of all sorts and kinds, a good proportion of which contain alum. Pickles are sometimes colored with copper; candies are colored with poisonous drugs. The Health Department of New York has seized, condemned, and destroyed thousands of pounds for this reason. Alum is sometimes put in poor flour and bread. Cream of tartar is often either impure or adulterated, and so on through the list. There is all the evidence that could be wished to show that adulteration is widely carried on. The worst and most dangerous cases are probably practiced on a small scale. When an establishment accumulates capital it becomes conservative.

Last year a confectioner in Philadelphia colored his buns yellow with chromate of lead. This was done to economize his eggs. The amount used, however, was so excessive that many persons sickened, and several deaths resulted from eating these adulterated buns.

The adulteration of drugs is, if anything, far more serious than that of food. The physician is left without any guide in administering his remedies, if he is not sure of getting what he prescribes. Reports again show that there is a very considerable amount of adulterations even here. Standard preparations are not up to standard, and sometimes inferior in quality, and even substitutes are employed. Without going further into details, I have presented evidence to establish the fact that adulteration of food and drugs is common enough to call for serious and careful attention on the part of every one. Here is a great evil that we need to be protected against, an evil affecting the business, health, and morals of the State.

As Californians, we have an especial interest in the maintenance of food purity. We are already recognized as one of the great wine producing countries of the world. Our wines are beginning to find markets in good measure because they are believed to be pure. We cannot afford to allow the good name already obtained to be injured by ignorant and unscrupulous persons. The pure wine law enacted by the last Legislature was simply the result of this sentiment among the wine growers. As a class, and as individuals, they are heartily opposed to any treatment of the wine that could in any way be considered as adulteration. The interests involved are too great to be jeopardized by introducing any doubtful practices even if they promised some temporary advantage.

The olive oil industry in this State is still in its infancy, but it gives good promise of a future here. The adulteration of olive oil in general, is a byword. It is known to everybody that cotton-seed oil is exported from the Southern States in large quantities to be mixed with the olive oil of France and Italy, to be again imported as pure olive oil. It is not claimed that cotton-seed oil is injurious, but it lacks the flavor of the pure olive oil and its admixture interferes with the development of the industry. If the mixed oil is sold for what it really is, and not for what it is not, no wrong can be done. This much of protection every one will be ready to concede towards the development of our infant industries.

Whence is to come this relief and protection? This in good part rests with ourselves. The condition of our trade is not so bad that good, pure articles of food cannot, as a rule, be had. There are intelligent and honest dealers who do the best they can to furnish the pure articles, which their customers require and are willing to pay for, but the pure articles cost more than the adulterated, and the consumer must be willing to pay the difference. The public must realize that there is an evil against which they must protect themselves. They must realize that it is a great and a threatening evil, and that each and every person is affected by it.

The citizens of the commonwealth need to be protected in the enjoyment of their rights; they need to be protected against dangers which threaten life, health, and property, and which they are powerless to resist. The food consumers have a right to demand that when they ask for bread, that they be not given a stone; and when they ask for a fish, that they shall not receive a serpent. One of the characteristics of our civilization is shown in the regard we pay to the helpless and unfortunate. Instead of allowing the weak and the crippled, those diseased in mind and body, to perish in the struggle for existence, the strong help to bear the burden of the weak, and we have seen the poor and sickly child develop under this system of nursing into a healthy maturity. The adulterated food affects most seriously the young and the invalid. We cannot judge of the effect of such food upon the robust man in vigorous exercise, for he can resist or throw off its action, but with the delicate digestion and lowered vitality of the invalid it is very different. They ask and deserve protection. We, the victims, demand protection against adulterations which, even if they are not injurious to health, are fraudulent. This is a wholesale robbery committed upon innocent and helpless victims. If the State has any function which is clearly and distinctly recognized, if it owes any duties to its subjects, surely it has both the right and should feel the obligation to protect against such frauds and impositions.

The honest tradesman and dealer asks protection against such stupendous frauds and deceit. In the fierce competition of business, the man who adulterates can undersell the honest man, and the man who undersells draws customers. The result is likely to be a demoralization of trade. The honest, conscientious man is driven out, or driven to the wall. The public is robbed; trickery, deceit thrive; public morals are degraded; there is no public confidence, no faith, no *esprit du corps*; and, as a consequence, private morals decline and the whole fabric of society is affected with a dry rot. What further legislation, if any, do we need? We have first the United States law in regard to oleomargarine, and a certain inspection of tea and drugs, when they are imported from foreign States and countries. A pure food bill was introduced into Congress at the beginning of the last session, the object of which was to improve the method of examination by furnishing competent chemists and well equipped laboratories to the various ports of entry, and also to enact stringent regulations against the manufacture and sale of adulterated food, drugs, etc., in the District of Columbia, and in the Territories. This bill is still in the committee, and it is uncertain what action will be taken. Our State law, as it seems to me, is insufficient. The revised Political Code makes it a misdemeanor to knowingly and willfully adulterate and sell adulterated food, etc. It fails, however, because no special provision is made for its enforcement. This is demonstrated by the experience of other States and other countries. Certain fundamental propositions in connection with the enforcement of regulations against adulterations have already been thoroughly established, and may now be accepted as axiomatic. The law should be very clear, leaving no loophole for escape through technicalities. Provision should be made for the free official analysis or examination of any food that any reasonable person may suspect of adulteration. Upon this point there seems to be little difference of opinion. There should be officers who are charged with the execution of the law. In Massachusetts, New York, and Michigan, this general responsibility is vested in the State Board of Health. In New Jersey and Ohio there is a special Food and Dairy Commission. I am not aware what legislation has been enacted by other States. It is clear that some action is necessary. It seems to me that this power and responsibility can well be placed upon our State Board of Health. Whatever body is charged with this work should have authority to appoint Inspectors, or should accept the Health Officers and Inspectors appointed by County and City Boards of Health. These Inspectors should send samples of food bought by them in the open market to the State Analyst for analysis, giving notice at the time what they are doing. As a rule, the request of any private person would be considered, and the Inspectors should see that the article to which attention was called was satisfactorily investigated.

Coöperation between the State and municipal authorities would simplify and assist and economize very much, otherwise it would be necessary for this body charged with the enforcement of the law to appoint and keep their own Inspectors, etc. What we must in any case depend upon is the support of the law by an intelligent and hearty public sentiment. When this condemns adulteration, no honorable firm and no firm with capital at stake will dare to disregard it. When it is known that there is a fair and honorable inspection of foods, the condemnation of an outraged public will supplement the condemnation of the Court. The dealer will be under a ban and he will feel the verdict of the public more then that of the Court. Perhaps it should be said that this work should be done in a conservative spirit. At times in other places it has been charged that this inspection was given to sensationalism, that the officers were sometimes over zealous to parade before the public the importance of their office. A true conservative spirit should be maintained and the interests of the whole community kept in mind.

In conclusion, I ought to say a word in regard to the pure wine law of this State. I believe that, in general, the effect is good. I know that the wine makers have been very careful to comply with the law. They are working with far greater intelligence than ever before. What is needed is a better provision for enforcing the law in regard to the retail trade.

REPORT OF COMMITTEES ON ORPHAN ASYLUMS AND ALMSHOUSES DRAWING AID FROM THE STATE.

Report of Committee on Protestant Orphan Asylum, Sacramento.

To his Excellency Governor Waterman:

The committee appointed by the State Board of Health to examine into the sanitary condition and administration of the Protestant Orphan Asylum, Sacramento, beg leave to report that having examined the building, its accommodations, sanitary condition, and administration, we find the building, although very old, in fair condition, but entirely too small for the purpose designed.

The number of orphans contained in the institution is one hundred and twenty-five at the present time. The sleeping rooms provided for these, give in the aggregate three hundred and thirty cubic feet of air space for each child, which is wholly inadequate to the requirements of the healthy body. The ventilation of these dormitories is obtained only by opening the windows and doors of the rooms, which should be obtained by other means, so that a constant current of fresh air be admitted without giving rise to drafts, which now makes sleeping in these rooms dangerous to children.

The water-closets on the various floors are fitted with the old fashioned dirty pan closets, which it is impossible to keep free from offensive odor; consequently, from their proximity to the sleeping rooms, they are dangerous to the health of the inmates, and should be removed. Indeed, for safety, all the water-closets should be removed from within the house and erected outside the walls, and properly ventilated to prevent all offensive odor. The closets were, however, as clean and well kept as their defective construction would allow.

We find the dormitories scrupulously clean; the beds supplied with sufficient clothing, and the bedding of good quality—all kept very neatly and cleanly. In each room, or adjoining it, are closets for the children's clothes, which are neatly folded and kept in good order. The children are comfortably clad, and each have a bath once every week, besides which they are washed, face, neck, and hands, daily, the younger ones perhaps oftener. The older children have free access to the wash-room and can wash frequently. We examined the heads and persons of many of the children, but found no evidence of vermin in any. The Matron proudly told us we would not find a louse or a bug in the house, which, as far as our observation could enable us to determine, was true.

The children upon interrogation had no complaints to make, physical punishment being the exception and not the rule in the institution.

The diet of the children consists of bread, butter, tea, and hash or mush for breakfast; meat, soup, vegetables, and fruit for dinner; and bread, utter, and tea or water for supper.

The dining room in the basement is large and airy, kept very clean and neatly furnished. The assistants in the house have a separate dining room. The kitchen is detached, comfortable, and attended by two Chinese cooks. They consume daily one hundred and fifty pounds of flour in bread making, the bread being light, white, and wholesome, and well baked. In the cellar we found abundant supplies of fruit, vegetables, and milk. The meat is bought daily as required. Seven cows supply the milk; the animals are kept on the premises and carefully tended.

The children's small play rooms are in the basement, and in these an hour's religious worship is held daily. In the yard some half dozen closets have been erected, under cover, for boys and girls; they are not of good pattern, and some of them not in working order on our visit. The atmosphere of these closets was foul, although the sewerage is good, being carried in drains to Fifteenth Street, and then pumped by the Shone system into the main sewer.

There is no fault to be found with the asylum in regard to its management. Its sanitary condition is susceptible of much improvement. The health of the children is good at present, and none sick of any infectious disease.

All of which is respectfully submitted.

W. R. CLUNESS,
GERRARD G. TYRRELL,
Committee.

SACRAMENTO, August 7, 1888.

REPORT OF COMMITTEE ON SAN DIEGO HOSPITAL AND ALMSHOUSE.

The committee appointed by the State Board of Health to examine into the sanitary condition and management of the San Diego County Hospital and Asylum, beg leave to report that at the date of visitation, September 11, 1888, the hospital contained forty-five patients; twelve receiving alms. We find the wards large, well ventilated, comfortably furnished, and clean. The bedsteads are iron, with wool mattresses. The food given to the patients is good in quality and quantity, but not well prepared, owing to a deficiency of help. The kitchen is small and not clean. The bathing facilities are sufficient, and each inmate gets a bath once a week. A detached building contains rooms for female patients. The dining room is small and not over clean. The privies are very dirty and need better attention.

The institution is well conducted, and no complaints were made except in regard to the cookery of the food, which can easily be remedied, but we must condemn the sanitary condition of the outhouses and the want of cleanliness in the kitchen and dining room. We stated these conclusions to the officers in charge, and they promised that this matter would at once receive their attention and be remedied.

The inmates appeared to be free from vermin, and had no complaint to make, upon private interviews with several.

H. S. ORME.
G. G. TYRRELL.

REPORT OF COMMITTEE ON SANTA CRUZ FEMALE ORPHAN ASYLUM.

The committee appointed by the State Board of Health to examine into the sanitary condition and administration of the Santa Cruz Orphan Asylum, beg leave to report that at the time of visitation the asylum contained, August 17, 1888, some fifty children, orphans and half orphans.

On the lower floor we found the rooms exceedingly neat, clean, and comfortably furnished. The dining room was quite well furnished with white tablecloths, napkins and rings, knives and forks, delph plates, cups, and saucers, and everything in the nicest order. The kitchen was very neat and scrupulously clean, pantry well supplied with provisions, the bread white, sweet, and well baked. The dietary was ample and varied daily.

In the dormitories we found the bedsteads iron, with straw mattresses overlaid by one of hair, the sheets scrupulously clean, a blanket and comforter, over which was a white counterpane, all in the best order. The floors were perfectly washed and clean; ventilation by windows and doors only.

The first dormitory is fifty-seven by twenty-five by ten, containing thirty-four beds for children between three and eleven years old, with a space for one Sister to superintend. The second dormitory, sixteen by twelve, contained eight beds, and one bed for supervising Sister. We also visited the small infirmary containing two beds, one curtained. The clothes room is a model of neatness, each child's garment having a separate locker and properly numbered.

The wash room was neatly matted, each child having a separate basin, towel, brush, comb, tooth and nail brush, and cake of soap. This was the neatest and most complete lavatory yet seen in any institution, and spoke volumes for the care the children received. The children are bathed regularly once a week in stationary washtubs, and are kept clean and neat. No vermin was found on the children or in the house. The house is devoid of water-closets, like all these old houses, but the privies were perfectly clean and in as good a condition as care could make them.

We were much pleased with this institution; as, after the most rigid examination, we could find nothing to condemn in the way of administration. The sanitation was excellent, with the means at hand. Ventilation was secured by windows, and carefully looked after by the Sisters, and with properly constructed water-closets would be in the best possible condition.

We believe the aid given by the State to this institution well bestowed and faithfully administered. When the new building now contemplated is erected, we believe that nothing further will be desired in making the asylum a perfect type of a well conducted institution.

W. R. CLUNESS.
G. G. TYRRELL.

Report of Committee on the Female Orphan Asylum, Grass Valley.

The committee appointed by the State Board of Health to examine into the sanitary condition and administration of the Orphan Asylum of Grass Valley, beg leave to report that at the time of visitation, August 20, 1888, the Female Asylum contained two hundred orphans and half orphans; ninety-five children from one to twelve years of age occupied a building detached from the main building.

The dormitories were large, well ventilated, and gave a cubic air space of five hundred feet for each child. The bedsteads were iron, hair mattresses, sheets, blankets, counterpane, and pillows, all perfectly clean and sweet. We found all the rooms well kept, everything in the best of order. The clothes rooms, wash rooms, recreation rooms, and school rooms perfectly clean and neat. The kitchen is large and well appointed. The dining rooms ample and well supplied with service of delph, spoons, knives, forks, and cups.

The dietary is ample and of good quality. The children are well clad, healthy, and well fed, without any complaints of their treatment. We consider this institution well conducted, its sanitary arrangement capable of much improvement in regard to water-closets and drainage, but on the whole it will compare favorably with any other institution of the kind in the State. There is no sickness in the institution, and the perfect cleanliness that is observed keeps the inmates free from vermin.

W. R. CLUNESS.
G. G. TYRRELL.

REPORT OF COMMITTEE ON BOYS ORPHAN ASYLUM, GRASS VALLEY.

The institution contains seventy-five orphans and half orphans.

The dormitories are large; bedsteads of iron; ventilation by windows and doors; bedclothes clean, neat, and in sufficient quantity. The children are washed daily; have a bath once a week; are well clothed; in good health, and free from vermin. We find their dietary ample, of good quality, and well prepared. The lack of sufficient water renders the sanitary arrangements defective, but every care is taken to keep all offensive odors destroyed and the closets clean. We think the institution well conducted, and the appropriation honestly expended. Every place inspected gave evidence of great care in keeping everything clean and sweet, and the boys were loud in their praises of their teachers and guardians.

W. R. CLUNESS.
G. G. TYRRELL.

REPORT OF COMMITTEE ON HOME FOR FEEBLE-MINDED CHILDREN.

The committee appointed by the State Board of Health to report upon the sanitary condition and administration of the Home for Feeble-Minded Children at Santa Clara, beg leave to report that they visited the institution August 14, 1888, and learned that there was then one hundred children upon the roll-call. We were conducted round the premises by Dr. Osborne, the Superintendent. The main school room was clean and well ventilated. The closets were of the latrine pattern, flushed frequently and without odor; these, with the wash basins, were properly trapped and in good order.

The primary class room accommodates fifteen pupils, giving an average of nearly two hundred cubic air space for each scholar. The higher class room accommodates ten scholars, where music, history, geography, and ornamental work is taught by a salaried teacher. The dormitories were next visitied; we found them neatly kept and perfectly clean. The beds were brass and supplied with straw and hair mattresses, blankets, sheets, counterpane, all perfectly clean and in sufficient quantity. The large dormitory contained seventeen beds, giving a cubic air space of five hundred feet for each boy.

The ventilation is by windows and doors, with closets and bath room off dormitory, all well trapped, clean, and without odor. The dormitory for small boys is forty by twenty-three by twelve, containing twenty-three children, giving an average air space of five hundred feet for each boy. The bedsteads are brass, well supplied with bedding, and everything neat, comfortable, and clean. The latrines or closets with wash rooms off the dormitory, are properly trapped and ventilated and emit no odor. The play room is heated by an iron stove, properly guarded against accident. Physical correction of the children is not permitted in the institution. The dining room contains seven tables, well furnished with white tablecloths, glasses, knives, forks, spoons, saltcellars, and crockery ware. The kitchen is ample, clean, and neatly furnished. The store room is well provided with provisions and groceries.

Outside the main building is a preserving room where the larger girls are employed cutting up and canning fruit. The cook's pantry is well provided with flour; ten barrels a month being used. Two hundred loaves are baked each week. The bread is white, sweet, and well baked. Seven cows are kept by the institution, which supply an abundance of fresh milk.

In a separate building from the main one is the girls' department, consisting of a dormitory for small girls, containing twenty-two beds; this is well lighted and ventilated; also a small room containing three beds; in another room are nine beds for epileptic inmates. These are all supplied with wash, bath rooms, and water-closets—everything neat and clean.

The water supply is obtained from a well one hundred and four feet deep, pumped by steam into large tanks, some seventy feet high. The laundry is supplied with steam power, and all washing and ironing is done by machinery.

The sewage is carried away by large drains into a field and there emptied into a large covered cesspool, some five hundred feet from the house.

The institution is under the medical charge of Dr. Osborne, and the management of the children under the care of the doctor's wife, Mrs. Osborne. Under the care of these officers, we find the institution most excellently managed; its sanitary arrangements as perfect as possible to make them; the children as clean, tidy, and well cared for as assiduous attention can bestow; and believe that this institution will compare favorably with any asylum of like character in the United States. We have nothing but commendation to offer, and think the aid conferred by the State is administered honestly and economically.

GERRARD G. TYRRELL.
W. R. CLUNESS.

Report of Committee on Female Orphan Asylum at San Juan.

The committee appointed by the State Board of Health to examine into the sanitary conditions and management of the Orphan Asylum of the Sacred Heart, at San Juan, San Benito County, beg leave to report, that at the time of visitation, August 18, 1888, there were in the institution seventy orphans and half orphans. The building is old and needs enlarging, but everything about it was neat and clean. The dormitory down stairs contains forty-seven beds for girls of all ages; it is fifty by thirty-two by twelve, giving a cubic air space for each child of four hundred feet. The ventilation is had though ventilators in walls and by windows. The bedsteads are iron with wire mattresses; straw bedding with sheets, blankets, counterpanes, and feather pillows; beds and clothing changed every week. A small dormitory containing two beds is on this floor for sick children; also a room for the occupancy of the Sisters. All beds, coverings, floors, etc., beautifully neat and clean. Up stairs is a dormitory ninety by thirty by ten, containing twenty-four beds, with same furniture as down stairs. Adjoining is a small room for Sisters.

The washing or bathing room contains twelve porcelain basins, with lockers for brushes, combs, soap, tooth brushes, and towels. The children are washed face, hands, and feet every day, and a general bath once in two weeks.

The sanitary arrangements for removing excreta is by tin buckets, there being no water-closets in the house. The buckets are removed and emptied every morning. This should be obviated by the erection of properly constructed closets, as more conducive to that propriety and modesty so inherent in the female mind.

The laundry is in a detached building, and no fault can be found with its management. The bath rooms were old, but clean, and were supplied with both hot and cold water. Seven water-closets were in the yard, kept clean, without odor, and unobjectionable. The dining room was well furnished with delph dinner service, knives, forks, glasses, and napkins, all scrupulously neat and clean. Water is supplied by a deep well and windmill.

No sickness was in the institution, all the children being in good health.

The school rooms were rather small for the number of children assembled. The pupils are, in addition to a good English education, taught embroidery and fancy work.

Examined the children and found them clean, comfortably clad, devoid of vermin, and emphatic in their declaration that they were well fed and cared for. Examined their dietary, and found it ample and of good quality. We are of the opinion that this institution deserves the support it receives from the State, and applies the money so received judiciously and well. No fault can be found with its administration, and its sanitary condition is as good as its means will allow.

W. R. CLUNESS.
G. G. TYRRELL.

Report of Committee on Pajaro Male Orphan Asylum.

The committee appointed by the State Board of Health to examine into the sanitary condition and administration of the Pajaro Valley Orphan Asylum, beg leave to report that upon the occasion of our visit (August sixteenth) the institution contained one hundred and eighty-seven boys, from two to fourteen years old—orphans and half orphans—under the superintendence of Father Clementine. The study hall is quite a large hall, seventy-two feet long and twenty-eight feet wide, with a height of twelve feet; it was clean and well furnished for the use intended. The smaller recitation rooms were also clean and neat. Up stairs the dormitories are provided with wooden bedsteads, straw mattresses, sheets, blankets, and quilts; fairly clean. No vermin were discovered. The floors were swept every morning, and the bed linen changed once a week. The dormitories are under charge of a lay Brother who sleeps off the room. Ventilation is by windows.

The first dormitory contains twenty beds for large boys. The room is thirty by twenty-eight by twelve, giving a cubic air space of four hundred feet, which is nearly sufficient.

The second dormitory for smaller boys is also thirty by twenty-eight by twelve, and contains twenty-five beds (this is for medium sized boys) with same cubic air space. The teacher, Professor McDonough, sleeps in a room between these dormitories, and overlooks the rooms at night.

The third dormitory is seventy-two by twenty-eight by eleven, and contains beds for fifty boys. The fourth dormitory is the same size as the third, and likewise contains fifty beds for medium-sized boys. Ventilators are placed in the walls near the roof in each of these dormitories, which, with the windows, give good ventilation. The upper dormitory is ventilated by an opening in the ceiling, and contains a less number of beds. The floors are all swept every morning.

There are no water-closets in the building, the night soil and urine being received in chambers in the rooms, which are emptied every morning. The lavatory, or wash room, is inadequate, but washes twenty boys at a time. The boys wash their faces and hands whenever they are dirty. Their bodies are washed once a week by hand, there being no bath rooms in the building; in the summer they are allowed to bathe in the lake at the rear of the building.

The privies are twelve in number, and empty into a latrine, which is filled with water and emptied once a week into a wooden sewer, which runs into the lake.

The water for the wash room is obtained by pipe and windmill from the lake. The laundry is adjoining, the washing being done by two Brothers of the Order, assisted by the larger boys, every Monday. The water for the laundry is also obtained from the lake. Comment is useless, for, although the lake is large, the water is more or less polluted.

The clothes room is in another building; the clothes are neatly folded in separate divisions and properly numbered. Adjoining this room is one where a tailor is employed to keep the clothes in order. Close by is the shoemaker's shop, where shoes are mended and the older boys taught the trade, if so desired.

A drug store is neatly fitted up and well stocked, under the supervision of a lay Brother.

There is no sickness in the asylum, and the children were all vaccinated, but not with that success which is absolutely necessary to insure safety.

The dining room is large and commodious, and furnished with tin cups, plates, and spoons. The kitchen is well furnished. There is a bakery attached, which uses a barrel of flour daily. The bread is white and brown, well baked, light, and nutritious. The butcher shop is in the yard, supplying thirty to forty pounds of meat daily. The butcher kills one steer and a pig monthly. The garden supplies all vegetables. Fruit is abundant and of good quality. The boys being assembled, we carefully examined them, found them well clad, clean, and without vermin. No corporal punishment is inflicted. The boys were interrogated and had no complaints to make; said they were well fed, slept warmly, and were well taken care of. We find the institution well managed, the sanitary arrangements being however deficient, tending to promote illness and to impair the general health of the boys. The food is ample, of good quality, and well cooked, and we believe the funds of the State are honestly applied for the purpose intended. If the bathing and removal of excrementitious matters were improved by proper sanitary arrangements, we believe no fault could be found with the asylum.

W. R. CLUNESS.
G. G. TYRRELL.

REPORT OF COMMITTEE ON HOME OF BENEVOLENCE, SAN JOSÉ.

The committee appointed by the State Board of Health to examine into the sanitary condition and administration of the Home of Benevolence, San José, beg leave to report that at the time of our visit, August fourteenth, the institution contained fifty-nine children, whose ages ranged from two to thirteen years. The children's sitting room, for boys and girls, the dimension of which was thirty by forty feet, was comfortably furnished, and kept clean; ventilation by windows. One room was devoted to sewing, where children's clothes were made and mended; in this room were clothes presses and wash room. The children have each a full bath once a week.

In the basement beneath the house is the children's play room—earthen floor, basement unfinished, not in good sanitary condition, and too dirty for the purpose intended. The privies are in the yard, about one hundred feet from the house; male and female closets under same roof, divided by partition, both filthy and horribly offensive. The boys' playground is divided from the girls by a latticed fence.

Four cows are kept in stable in this yard, which supply milk and butter in part to the institution. The main building is heated in winter by furnace.

Examined the children, detected no vermin. The children were fairly clad, contented, and had no complaints to make. Passing into the house and upstairs, we examined the dormitory for middle-sized boys. It contained twenty beds. Bedsteads of iron, mattress straw, with blanket, sheet, and counterpane, all neat and clean; room carpeted down center with home-made rag carpet. Off this room is sleeping apartment for lady in charge of dormitory. Second dormitory contains eight beds for boys under ten years of age. Furniture same as other dormitory and equally clean. Third dormitory contains eight beds for larger boys, which did not differ from the others.

The wash room for boys is not large enough. There is but one bathtub in the house, and one old-fashioned pan water-closet, which is only used in case of necessity. The urine and other excrementitious matters are collected in cans, and removed each morning from the dormitories, an indecent and disgusting mode of procedure, but no other is available in the institution at present.

In the girls' department, the rooms are just like the boys'. The beds are clean, and sufficient clothing is provided. The floors are painted, and rag carpets occupy the center of each dormitory. The sanitary arrangements for night soil is on the same plan, and even more to be condemned than for the boys', as it tends to lessen that innate modesty peculiar to the female sex, and is destructive of all privacy.

Physical punishment is not applied to either sex, except in the mildest form.

The dietary is ample and of good quality. The bread sweet, white, well baked, and wholesome; meat is given daily.

The water is supplied by a well, and appears to be of good quality. We must, however, condemn unqualifiedly the sanitary condition of the outhouses and privies, and the mode of receiving the night soil in the institution. We also must condemn the absence of sufficient bathing facilities for both boys and girls, and recommend that a covered bath-house be erected, properly supplied with bathtubs and modern water-closets for the use of the inmates.

W. R. CLUNESS.
G. G. TYRRELL.

Report of Committee on Insane Asylum, Stockton.

The undersigned, a committee chosen by the State Board of Health July 26, 1888, to make an examination into the sanitary condition of such public institutions in Southern California as draw money from the State Treasury, have attended to the duty assigned to them, and would now respectfully report:

On July twenty-seventh we visited the State Insane Asylum at Stockton. We were very kindly received by the Superintendent, Dr. W. H. Mays, who offered us every facility for a thorough examination of the institution. While we find much to commend, there were some matters which we feel to be our duty to condemn, and of sufficiently vital importance to bring to official notice. and recommend immediate attention thereto.

The first and most important point to which we would call attention, is the crowded condition of the institution. Allowing the regular legal amount of cubic air space per capita, we find there is not quite room for one thousand two hundred persons to be accommodated, while the present number is near one thousand seven hundred. For that number of patients we think the medical attendance too small. With so few medical officers it is utterly impossible to render to each case such care and attention as their physical wants require, not mentioning that care that their unfortunate mental condition demands and in this enlightened age should receive. There should be not less than two more physicians, and they should reside on the premises. We were much surprised to find that the ventilating shafts from wards in lower stories of female department terminated in the attic story, in which now, on account of the crowded condition of the building, the Superintendent is obliged to place patients, thus subjecting them to an exposure to the vitiated air arising from the lower stories. We recommended immediate attention to carrying these air shafts through the roof. We found the south wall of female department in a very bad condition; the bricks of which being porous, and not covered by paint or cement, allow the rain and moisture to percolate through them, thus rendering the inner walls and ceiling damp, and capable of producing much discomfort as well as danger to the health of the patients.

We called the attention of the Directors to a few other matters strictly within their province, separate from legislative enactment, and they cheerfully remedied them.

The matter of the sewerage of the institution, which is in a very bad condition, is now receiving the earnest and active consideration it deserves.

The sum total of the condition of this institution is that the Directors are expected to accomplish too much with too little money. The legislative appropriations are too small for the successful management of a public charity of the magnitude of the Stockton Insane Asylum.

H. S. ORME.
C. A. RUGGLES.

Report of Committee on San Joaquin County Hospital.

On July twenty-eighth we visited and critically examined the County Hospital of San Joaquin County. We find it to be a large, comfortable, and commodious wooden building, well adapted to hospital purposes. It is situated on the eastern border line of the City of Stockton. The supply of water is from the city waterworks and from deeply cased wells, is of excellent quality, and abundant in quantity. The building is well supplied with hydrants and hose, and well protected from fire. The drainage and sewerage is good. We found fifty-four persons receiving aid from the State Treasury. From personal examination and conversation, we found them well cared for, well fed, well clad, and as happy and contented as could be expected under the circumstances. We found that the officer in charge had segregated those drawing State aid. We advised that the separation be discontinued, as it tended to cause a feeling of superiority over the strictly county inmates, which suggestion was immediately adopted.

H. S. ORME.
C. A. RUGGLES.

Report of Committee on County Hospital, Los Angeles.

The County Hospital of Los Angeles County was next visited by us. Great courtesy and kindness were showed us by the Resident Physician and his assistant. The total number of patients was one hundred and forty-five, of which number twenty-five were receiving aid from the State. They were critically examined and closely questioned, and were found to be well clad, well fed, well cared for, and happy and contented. We cannot say that we were much pleased with the hospital building, as it is very poorly adapted to the purpose designed. It surely would not receive the indorsement of modern sanitary engineers. There are too many patients in a limited space; the wards are very much crowded, but that difficulty will soon be remedied, as we are assured by the Supervisors that as soon as the building now being erected at Downey is completed at least sixty persons will be removed thereto. The water supply is very limited—too small for successful flushing of hospital drains, and no protection against fire. The water-closets are unfortunately placed in the building, and, in consequence of the small supply of water for flushing purposes, are in a very unsanitary condition. The drains carry off, to an open cesspool in a distant ravine, the entire sewage of the institution, far enough away from the building as not to affect it, but near enough to surrounding property to be an intolerable nuisance, destructive to the personal enjoyment of property and dangerous to public health.

C. A. RUGGLES.
H. S. ORME.

Report of Committee on State Normal School.

The State Normal School at Los Angeles was visited and thoroughly examined. At the last visit of a committee of this Board many valuable and important suggestions for change and improvement were made to the officers in charge. We find that all of those suggestions have been adopted. Great improvements have been made in ventilation and sewerage, and it affords us much pleasure to say that the institution is in an excellent condition.

C. A. RUGGLES.
H. S. ORME.

Report of Committee on Los Angeles Orphan Asylums.

We next visited the Los Angeles Orphan Asylum (Catholic). It is to be much regretted that the management of this charity are compelled to continue in this ancient, antiquated building, so utterly and completely unfit for an institution of that character and magnitude, many portions of the building unsafe as well as untenable. We learn with pleasure that the plans are drawn for a larger and better building, and it will soon be completed, in which very particular attention has been given to provide a thorough system of ventilation and all other sanitary improvements. We found one hundred and fifty-four inmates—thirty-three whole orphans, and one hundred and twenty-one half orphans. The building is ventilated by means of doors and windows. There are eight dormitories, averaging thirty-three feet by twenty-three feet and ten feet high, with an average of twenty-one beds in each ward, occupied by twenty-one children; a Sister always sleeps in the same room with the children. The institution has been peculiarly favored during the year as to sickness. Only five cases of measles, with no deaths, have occurred. The water supply is from the city waterworks, is ample and of good quality. The water-closets, as is all the household sewage, are discharged into public sewers by pipes which are properly trapped. We made a careful personal inspection of the children and found them cleanly, well fed, well clothed, and happy.

On August third, we visited the Los Angeles Protestant Orphan Asylum. The present number of inmates is eighty-one—fifty-eight boys and twenty-three girls. There are six whole orphans and seventy-five half orphans. The building is old, and for an institution of this size and character it is highly unfit, having outlived its usefulness. The new building now being erected will soon be ready for occupancy, and will have all the modern improvements of a sanitary nature. The present building is ventilated by doors, transoms, and windows. The wards or dormitories are too crowded. No matron or attendant sleeps in same room with the children. We advised a change in that respect, as accidents and sudden sickness are liable to take place in the night, when the assistance of an attendant would be very necessary. The water is supplied by the city waterworks; it is very good and abundant. The children are cleanly, well clad and well fed, and to all appearances happy and contented. From our examination of this institution we would draw these conclusions: *First*—Too much crowded condition of building. *Second*—An unsanitary condition of water-closets and their surroundings. All of which we believe will be remedied on occupation of the new building.

C. A. RUGGLES.
H. S. ORME.

REPORT OF COMMITTEE ON ST. VINCENT'S ORPHAN ASYLUM, SANTA BARBARA.

We then visited the St. Vincent's Female Orphan Asylum, at Santa Barbara. We were very kindly received by the Sisters in charge, who afforded us every facility for a complete and thorough examination of the institution. We were conducted through all the dormitories, school rooms, dining rooms, and cooking rooms. The children were drawn up in line for personal inspection, the authorities courting the most critical examination possible. It is conducted by the Roman Catholic denomination. The present number of inmates is fifty-five—twenty-six whole orphans and twenty-nine half orphans. The building is well ventilated by doors and windows. There are two dormitories, each seventy-five feet by thirty feet, and sixteen feet high. In one dormitory there are twenty-five beds, and thirty in the other. Two Sisters sleep in each ward to render any assistance to the little ones at night. The water supply is from the city waterworks, is good, and amply sufficient. The water-closets are separate from the building, discharging into cesspools, which are often emptied and disinfected. The children are well clad and well fed. A personal examination of food showed it to be of the best quality, and the larder well supplied with all the necessaries, and many luxuries, of life. We would express ourselves as well satisfied with the condition and management of this institution.

C. A. RUGGLES.
H. S. ORME.

Report of Committee on Merced County Hospital.

The County Hospital of Merced County was next visited. The institution is situated about one mile south of the town of Merced, near the line of the Southern Pacific Railroad. The buildings are old and illy adapted to hospital purposes. We regretted the absence of Dr. Rucker, the physician in charge, but were shown every attention by the Steward. We found that there were seventeen patients drawing State aid. A personal examination showed them to be in a happy, contented condition, well clad, and well fed. The building is well ventilated. The water supply is good and abundant. The sewage is conducted in pipes to a large cesspool fifty yards from the building.

CHAS. A. RUGGLES, M.D.
HENRY S. ORME, M.D.

REPORTS ON INDIGENT SICK IN COUNTY HOSPITALS.

REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

Treated in the Mono County Hospital for the year ending June 15, 1888.

Total by each Disease	DISEASES.	No. Deaths by each Disease	Total by each Disease	DISEASES.	No. Deaths by each Disease
5	Rheumatism	0	1	Chronic syphilis	0
1	Typho-malarial fever	0	1	Hypertrophy of heart	1
1	Cystitis	0	3	Wound	0
1	Paralysis	0			

Number of months reported	12	Discharged	3
Total on hand at commencement of year	2	Died	1
Total admitted	11	Percentage of deaths	7.5
Discharged cured	7	Remaining under treatment	2

Name and location of hospital: MONO COUNTY HOSPITAL, Bodie, California, eight thousand three hundred and fifty feet above sea-level.

Physician's name and Post Office address: D. WALKER, M.D., Bodie, California.

REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

Treated in the Merced County Hospital for the year ending May 31, 1888.

Total by each Disease	DISEASES.	No. Deaths by each Disease	Total by each Disease	DISEASES.	No. Deaths by each Disease
4	Rheumatism	-----	1	Laryngitis	----
9	Intermittent and bilious fever	1	2	Suppressed secretion	----
9	Accidental injuries	-----	2	Ulcer of leg	----
3	Lumbago	-----	4	Measles	----
2	Asthma	-----	1	Dyspepsia	----
8	Dysentery	1	1	Spinal disease	----
3	Alcoholism	1	1	Pleurisy	----
1	Cancer	1	1	Hemorrhage of bladder	----
3	Typhoid fever	1	2	Locomotor ataxia	----
3	Bronchitis	-----	1	Sunstroke	----
4	Phthisis pulmonalis	-----	1	Tonsilitis	----
2	Tuberculosis mesenterica	2	1	Syphilis	----
4	Pneumonia	1	1	Paralysis	----
2	Erysipelas	-----	1	Heart disease	----
1	Inguinal hernia	1	22	Indigent	----

Number of months reported	12	Discharged	79
Total on hand at commencement of year	19	Died	9
Total admitted	90	Remaining under treatment	21
Discharged cured	63		

There are three of us that have the hospital here, and as we attend it month about, I cannot vouch for this being critically correct. The condition and location are fair. Sewage runs into a cesspool, covered. Ventilation is very good in the large new ward, but the balance of the structure, which is old, and was moved to the present site, consists of small rooms, and the ventilation is faulty. This old part has been used about fifteen years; was moved and refitted about four years ago. The cases of intermittent fever are brought from a distance, there being no case within eighteen miles of this town at present. The twenty-two cases marked "indigent" are old, broken-down men, who are out of funds, not able to earn a living, with nothing special the matter with them. Women are seldom admitted. The Supervisors generally allow a monthly stipend ($15) to their friends to care for them outside, although we now and then have one. One case of locomotor ataxia has been bed-ridden for about seven years. The cases of phthisis remained awhile, and asked permission to leave, as they frequently do.

Name and location of hospital: Merced County Hospital, Merced County, California.
Physician's name and Post Office address: H. N. Rucker, Merced, California.

REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

Treated in the Fresno County Hospital for the year ending June 30, 1888.

Total by each Disease	Diseases.	No. Deaths by each Disease	Total by each Disease	Diseases.	No. Deaths by each Disease
3	Diarrhœa	1	2	Heart disease	----
4	Dysentery	-----	9	Paralysis	----
2	Smallpox (at the pesthouse)	-----	3	Convulsions	----
5	Measles	-----	14	Rheumatism	----
2	Diphtheria	-----	2	Burns	1
2	Erysipelas	-----	1	Blind	----
2	Typhoid fever	1	10	Injuries, external	----
29	Remittent and intermittent fever	-----	7	Simple fractures	----
5	Chronic alcoholism	3	5	Compound fractures	----
13	Phthisis pulmonalis	4	10	Tertian syphilis	----
11	Pneumonia	2	2	Carbuncle	----
4	Pleurisy	-----	3	Granulated eyelid	----
9	Bronchitis	2	1	Gunshot wound	----
1	Asthma	-----	1	Cystitis	----
16	Disease of stomach and bowels	2	1	Snake bite	----
2	Disease of the liver	-----	2	Necrosis	----
3	Bright's disease and nephritis	2			

Number of months reported	12	Discharged	10
Total on hand at commencement of year	33	Died	18
Total admitted	186	Percentage of deaths	9⅔
Discharged cured	127	Remaining under treatment	31

In October next we shall be in our new hospital building which is now being erected, and will cost $25,000, and is being built on the plan of the Sacramento County Hospital. It is located about two miles east of Fresno, on high ground, and fine facilities for drainage. Street railroad running within one hundred yards of it. It consists of eighty acres, purchased by the county about two years ago at a cost of $120 per acre, and can now be sold for $500 per acre. I established the Fresno County Hospital in 1871, and have had the entire control and management of it since. I furnish everything, and manage it as I do my family; make and present my bill monthly, which is always paid.

Name and location of hospital: Fresno County Hospital, Fresno, California.
Physician's name and Post Office address: Lewis Leach, Fresno, California.

REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

Treated in the Plumas County Hospital for the six months ending June 30, 1888.

Total by each Disease	DISEASES.	No. Deaths by each Disease	Total by each Disease	DISEASES.	No. Deaths by each Disease
1	Paralysis	-----	1	Frostbite	----
9	Chronic rheumatism	1	1	Eczema	----
2	Old age	-----	1	Syphilis	----
1	Pelvic abscess	-----	1	Valvular disease of the heart	1
1	Varicose veins	-----	1	Neuralgia	----

Number of months reported	6	Discharged cured	6
Total on hand at commencement of year	10	Died	1
Total admitted	19	Remaining under treatment	12

The Plumas County Hospital is situated one mile from Quincy, and is in a pleasant, sunny place. The building was built for the purpose; it is one hundred feet long by twenty-six feet wide, with an L forty-two by twenty feet, and is well built and furnished. Sewerage and ventilation good. Supplies everything that is needed. Medical attendance as often as needed, or at least twice a week. Each patient has a room eleven feet by nine and one half feet, and eleven feet high. Water supplies are good—plenty of cool spring water.

Name and location of hospital: PLUMAS COUNTY HOSPITAL, Quincy, California.
Physician's name and Post Office address: L. F. CATE, Quincy, California.

REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

Treated in the Lassen County Hospital for the month ending June 30, 1888.

Total by each Disease	DISEASES.	No. Deaths by each Disease	Total by each Disease	DISEASES.	No. Deaths by each Disease
1	Endocarditis	-----	1	Compound fracture of tibia and fibula, followed by secondary amputation	----
1	Tertian syphilis	-----			

Number of months reported	1	Remaining under treatment	3
Total admitted	1		

REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

Treated in the San Luis Obispo County Hospital for the half year ending June 30, 1888.

Total by each Disease	Diseases.	No. Deaths by each Disease	Total by each Disease	Diseases.	No. Deaths by each Disease
1	Fever, intermittent	-----	1	Conjunctivitis	----
1	Variola	1	1	Sycosis menti	----
1	Rubeola	-----	2	Alcoholism	----
7	Rheumatism	-----	1	Curvature of spine	----
1	Nephritis	-----	1	Dislocation of spine	----
1	Hæmatemesis	-----	1	Fracture of femur	----
1	Diarrhœa	-----	1	Incised wound	----
3	Phthisis	3	1	Ulcer of leg	----
2	Syphilis	-----	1	Paralysis	----
1	Peritonitis	1	6	Contused wounds	----
3	Bronchitis	-----			

Number of months reported	6	Dischared cured	38
Total on hand at commencement of year	18	Died	5
Total admitted	38	Remaining under treatment	13

Name and location of hospital: San Luis Obispo County Hospital, San Luis Obispo, Cal.
Physician's name and Post Office address: W. W. Hays, San Luis Obispo, California.

REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

Treated in the Contra Costa Hospital for the three months ending July 31, 1888.

Total by each Disease	Diseases.	No. Deaths by each Disease	Total by each Disease	Diseases.	No. Deaths by each Disease
2	Eczema	-----	1	Paralysis	----
1	Gastritis	1	1	Tumor	----
1	Fracture of skull	1	4	Bronchitis	----
4	Rheumatism	-----	2	Pneumonia	1
1	Fracture of leg	-----	1	Cancer of the stomach	1
1	Fracture of toe (amputation)	-----	1	Rupture of bowels	1

Number of months reported	3	Discharged	5
Total on hand at commencement of year	23	Died	5
Total admitted	23	Remaining under treatment	17
Discharged cured	17		

Name and location of hospital: Contra Costa County Hospital, Martinez, California.

REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

Treated in the Los Angeles County Hospital for the six months ending August 31, 1888.

Total by each Disease	Diseases.	No. Deaths by each Disease	Total by each Disease	Diseases.	No. Deaths by each Disease
5	Aneurism aorta	1	3	Jaundice	----
5	Abscess	----	2	Masturbation	----
7	Anchylosis	----	1	Nasal catarrh	----
2	Amputation	----	3	Neurasthenia	----
1	Apoplexy	1	3	Neuralgia	----
10	Asthma	----	4	Necrosis	----
1	Ascetis	1	2	Orchitis	----
12	Bubo	----	1	Opium poisoning	----
8	Bronchitis	----	2	Ophthalmia	----
7	Bright's disease	3	1	Pleuro-pneumonia	1
4	Burns	----	46	Phthisis	29
5	Cancer	1	9	Pneumonia	3
1	Conjunctivitis	----	9	Pleurisy	----
1	Cerebro-spinal meningitis	1	5	Pregnancy	----
2	Concussion of brain	----	14	Paralysis	3
2	Carbuncle	----	1	Paralysis optic nerve	----
1	Congestion of brain, acute	1	2	Psoas abscess	2
1	Cataract	----	3	Prostatitis	----
2	Coxitis	----	3	Rubeola	----
1	Chorea	1	2	Railroad accident	1
11	Dysentery	----	50	Rheumatism	----
14	Delirium tremens	2	42	Syphilis	----
6	Dislocations	----	11	Sprains	----
3	Diarrhœa, chronic	----	5	Skin disease	----
3	Dyspepsia	----	5	Stricture urethra	----
3	Epilepsy	----	5	Septicæmia	2
3	Erysipelas	----	2	Starvation	----
4	Fistula in ano	----	1	Syphilitic hepatitis	1
7	Fractures	----	1	Sciatica	----
3	Furuncle	----	1	Sunstroke	----
38	General debility	3	1	Tuberculosis of testicle	----
5	Gonorrhœa	----	1	Typhoid pneumonia	1
2	Hernia, strangulated inguinal	----	18	Typhoid fever	5
2	Hydrocele	----	2	Uterine disease	----
4	Hemorrhoids	----	1	Variola	----
5	Heart disease	1	8	Varicose veins	----
15	Intermittent fever	----	5	Wounds, contused	----
7	Insanity	----	7	Wounds, incised	----
1	Internal injuries, fall	1	1	Wounds, lacerated	----
4	Influenza	----	4	Wounds, gunshot	1

Number of months reported	6	Discharged improved	56
Total on hand at commencement of year	162	Died	65
Total admitted	489	Remaining under treatment	133
Discharged cured	400		

Los Angeles County Hospital and Farm is situated in Los Angeles County, about one mile east of the city, on a farm of thirty-seven acres of rolling ground; is high and dry, with a fine view of the city and surrounding country. The hospital is surrounded by a fine orchard of orange, lemon, apple, peach, fig, and other fruit trees. The front is nicely laid out in flowers, and each side of the entrance road is bordered with cypress hedges, as is the front on both sides of the entrance. Along the sides and back are numerous pepper trees, for shade. The hospital is a large fine building of wood, two stories high, each twelve feet in clear, hard finished throughout, is set up about five feet from the ground, with wide porches around the front of building, and a wide porch above and below in the rear; containing seven large wards in the main building and two sunny wards in the rear, which are used for consumptive patients; each with nine or ten beds, each lighted with nine large windows. Both wards stand up ten feet above the ground; under one is the laundry fitted up with stationary tubs and hot and cold water. The seven large wards in the main building have room for ten or twelve beds in each. Two of the wards on the south each have five large windows; the two on the east and west front each have four windows. The main hallway is twelve feet wide; cross halls between the wards are ten feet wide. There are water-closets and bath rooms on each floor. The front is occupied as office, dispensary, and storeroom, on one side of the hall; the other is occupied as reception room and library. The second floor has three of the large wards and four smaller rooms that are occupied by the steward, matron, and nurses. In the rear of the main building, between the two wards in the rear, is the dining room, seating at present fifty-four; under the dining room is the kitchen, fitted up with range and hot-water tank, also storeroom and dining room for employés. The house is supplied with water from the city water works. The sewerage is good, having a fall of about fifty feet, to a ravine with running water in, in the rear of the farm. Supplies are bought in Los Angeles as needed. Dr. Barton Dozier is medical attendant—visits every day. The house was built in 1878, and is now in good condition. The area to each patient I do not know.

Name and location of hospital: Los Angeles County Hospital, Los Angeles, California.
Physician's name and Post Office address: Barton Dozier, Los Angeles, California.

REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

Treated in the Kern County Hospital for the year ending May 31, 1888.

Total by each Disease	Diseases.	No. Deaths by each Disease	Total by each Disease	Diseases.	No. Deaths by each Disease
20	Malarial	1	9	Secondary syphilis	----
6	Malarial fever	-----	6	Paralysis	1
4	Consumption	2	18	Rheumatism	----
7	Pneumonia	2	2	Diabetes	----
2	Bronchitis	-----	1	Fracture of leg	----
5	Dysentery	2	1	Fracture of arm	----
2	Measles	-----	4	Asthma	1
2	Typhoid fever	-----	20	Biliousness	----
1	Typhoid pneumonia	-----	12	General debility	1
1	Erysipelas	-----	1	Overitis	----
7	Alcoholism	1			

Number of months reported	12	Discharged	129
Total on hand at commencement of year	13	Died	11
Total admitted	131	Percentage of deaths	12
Discharged cured	112	Remaining under treatment	16

The Kern County Hospital is situated one third of a mile southwest of the town of Bakersfield, and consists of a frame building. Two wards, twenty by thirty feet, each containing eight beds; also three single rooms, twelve by fourteen feet—two of them containing two beds each, and the other one bed—office and dispensary, hall, kitchen, dining room, and bath room, with a ten feet wide porch on the north and east side of the building. There is also a block of land, appropriated for recreation grounds and the raising of fruit and vegetables. The hospital receives its supply of water from the Bakersfield water works. The system of sewerage is ample for the accommodation of the institution. Dr. L. S. Rogers is the attending physician. The steward regulates the furnishing of supplies and medicines, there being no contract system. The Board of Supervisors pays all bills.

Name and location of hospital: Kern County Hospital, Bakersfield, Kern County, Cal.
Physician's name and Post Office address: L. S. Rogers, Bakersfield, California.

FINANCIAL STATEMENT.

STATEMENT

Of the Expenses of the State Board of Health for Thirty-eighth Fiscal Year, ending June 30, 1887.

1886.			
Appropriation			$1,250 00
July	1—Post Office rent	$2 00	
	3—Traveling expenses of Dr. Briceland	35 00	
	Traveling expenses of Dr. H. S. Orme	50 00	
	Traveling expenses of Professor Rising	10 00	
	Postage stamps, Dr. Orme	10 00	
	12—Postal cards	12 00	
	28—Expressage	65	
	Rent of office	25 00	
Aug.	30—Stamps	10 00	
	Telegrams	1 25	
	Office rent	25 00	
Sept.	1—Post Office rent	2 00	
	Expressage and telegrams	2 50	
	Rubber stamps for office	4 50	
	28—Postage stamps	10 00	
	30—Office rent	25 00	
Oct.	5—Telegraph and expressage	2 75	
	10—Blank cards, $1; Sanitary News, $2	3 00	
	Sanitary Engineer	4 00	
	19—Traveling expenses of Dr. H. S. Orme	50 00	
	Expenses to Toronto. American Public Health Association	100 00	
	Traveling expenses of Dr. H. C. Crowder	8 00	
	Traveling expenses of Dr. J. M. Briceland	25 00	
	Traveling expenses of Dr. Jas. Simpson	12 00	
	20—Conference Board of Health	5 00	
	Annals Hygiene	2 00	
	Stamps for biennial report	45 00	
	Expressage	2 40	
	Office rent	25 00	
Nov.	1—Postage stamps	10 00	
	6—American Public Health Association, vol.	5 00	
	Expressage	1 05	
	30—Postage stamps	20 00	
	Office rent	25 00	
Dec.	9—Postal cards	5 00	
	11—Stamps	5 00	
	31—Office rent	25 00	

FINANCIAL STATEMENT—Continued.

1887.		
Jan. 3—Post Office rent	$2 00	
5—Expressage and telegraphing	4 15	
13—Traveling expenses of Dr. Orme	50 00	
Traveling expenses of Dr. Briceland	25 00	
27—Postage stamps	15 00	
Office rent	25 00	
Feb. 5—Sanitarian	4 00	
Stamps	5 00	
20—Telegraping	2 40	
26—Traveling expenses	10.00	
28—Telegrams	2 00	
Expressage	2 95	
Office rent	25 00	
Mar. 1—Telegrams and expressage	31 70	
30—Stamps	10 00	
Post Office rent	2 00	
Rent of office	25 00	
April 10—Traveling expenses of Dr. H. C. Crowder	8 00	
Traveling expenses of Dr. Briceland	20 00	
Traveling expenses of Dr. H. S. Orme	70 50	
Traveling expenses of Dr. G. G. Tyrrell	20 00	
Telegraphing	6 00	
Stamps	5 00	
Dunscombe & Co.	3 60	
Office rent	25 00	
May 10—Postal cards	10 00	
20—Stamps	10 00	
Telegraphing	1 05	
Office rent	25 00	
June 22—Traveling expenses of Secretary	17 50	
29—Hotel expenses, eight days	40 50	
Stamps	10 00	
Postal cards	5 00	
Office rent	25 00	
E. W. Maslin, legal services	100 00	
Total	$1,249 65	
Balance	35	
Total	$1,250 00	$1,250 00

STATEMENT

Of the Expenses of the State Board of Health for Thirty-ninth Fiscal Year, ending June 30, 1888.

1887.			
Appropriation		----------	$1,250 00
July	1—Post Office rent	$2 00	
	15—Traveling expenses of Dr. H. S. Orme	50 00	
	Traveling expenses of Dr. H. C. Crowder	10 00	
	Traveling expenses of Dr. J. M. Briceland	25 00	
	Telegraphing	1 55	
	Office rent	25 00	
	29—Annals Hygiene	2 00	
Aug.	8—Stamps	10 00	
	Telegraphing	1 50	
	31—Office rent	25 00	
Sept.	8—Stamps	10 00	
	28—Traveling and hotel expenses	10 00	
	30—Stamps	5 00	
	Telegraphing, monthly bill	3 85	
	Postal cards	5 00	
	Post Office rent	2 00	
	Office rent	25 00	
Oct.	14—Expressage Sanitary News	2 75	
	Conference State Board of Health	5 00	
	18—Sanitary Record	2 50	
	Telegraphing bill	5 30	
	Traveling expenses of Dr. H. S. Orme	60 00	
	Traveling expenses of Dr. H. C. Crowder	10 10	
	Traveling expenses of Dr. J. M. Briceland	23 50	
	Traveling expenses of Dr. Jas. Simpson	14 00	
	Traveling expenses of Dr. R. B. Cole	13 00	
	Office rent	25 00	
Nov.	7—Stamps and postal cards	10 00	
	Official seal	10 00	
	8—Telegraphing	89	
	30—Stamps	15 00	
	31—Office rent	25 00	
Dec.	13—Traveling expenses, Truckee, etc.	16 20	
	Post Office rent	2 00	
	Telegraph bill	6 97	
	Office rent	25 00	

FINANCIAL STATEMENT—Continued.

1888.			
Jan.	12—Stamps	$10 00	
	Traveling expenses of Dr. Briceland	25 50	
	Traveling expenses of Dr. C. A. Ruggles	8 40	
	Traveling expenses of Dr. H. C. Crowder	13 50	
	Traveling expenses of Dr. R. B. Cole	15 00	
	Traveling expenses of Dr. H. S. Orme	50 00	
	15—American Public Health Association	5 00	
	25—Postage stamps	20 00	
	27—Postal cards	20 00	
	31—Office rent	25 00	
Feb.	3—Express charges on smallpox circulars	19 15	
	Postal wrappers	4 20	
	Sanitarian	4 00	
	Express charges on Conference State Boards of Health	4 80	
	12—Stamps	10 00	
	Two hundred reports of National Conference	7 00	
	Office rent	25 00	
Mar.	12—Vaccination Vindicated	2 00	
	13—Traveling expenses to San Francisco	10 00	
	12—Expenses to Calaveras County	27 70	
	Expressage on circulars	4 06	
	Stamps	5 00	
	Post Office box	2 00	
	30—Expenses to Watsonville and return	13 50	
	Office rent	25 00	
April	17—Traveling expenses of Dr. H. S. Orme	70 65	
	Traveling expenses of Dr. Briceland	31 30	
	Traveling expenses of Dr. C. A. Ruggles	20 40	
	Traveling expenses of Dr. G. G. Tyrrell	27 00	
	30—Stamps	10 00	
	Telegraphy	4 13	
	Office rent	25 00	
May	20—Stamps	10 00	
	Telegraph and express charges	2 21	
	Office rent	25 00	
June	12—Expenses to San Francisco	11 00	
	20—Expenses to San Francisco and return	8 50	
	25—Postage stamps	10 00	
	Telegraph	65	
	Post Office rent	2 00	
	31—Office rent	25 00	
	Total	$1,123 76	
	Balance	126 24	
	Total	$1,250 00	$1,250 00

Expenses of State Board of Health on Account of Contagious and Infectious Diseases for Thirty-eighth and Thirty-ninth Fiscal Years, 1887-8.

1887.		
Appropriation		$10,000 00
Mar. 12—Traveling expenses of the State Board to Los Angeles, San Diego, etc.	$432 00	
Salary of Dr. H. J. Borde, Quarantine Officer, Tulare	44 35	
Salary of Dr. M. J. Rowley, Quarantine Officer, Mojave	56 45	
Salary of Dr. James J. Choate, Quarantine Officer, Colton	57 10	
Salary of Dr. C. B. Brierly, Quarantine Officer, Barstow	57 10	
Salary of Dr. W. A. Weldon, Quarantine Officer, San Pedro	25 00	
Salary of Dr. J. H. Magee, Quarantine Officer, San Diego	8 25	
30—Vaccine virus for Inspectors	30 20	
April 30—Salary one month, Dr. H. J. Borde	125 00	
Salary one month, Dr. M. J. Rowley	125 00	
Salary one month, Dr. J. J. Choate	125 00	
Salary one month, Dr. C. B. Brierly	125 00	
Salary one month, Dr. W. A. Weldon	50 00	
Salary one month, Dr. T. H. Magee	25 00	
Telegraphing to officers, etc.	7 74	
1888.		
Jan. 1—Telegraphy	9 52	
Feb. 1—Salary of Dr. S. P. B. Knox, Inspector, Santa Barbara	50 00	
Salary of Dr. Taggart, Inspector, Tulare	63 30	
Jan. 7 to 14—Salary of Dr. Wyman, Inspector, Tulare	20 00	
Vaccine virus to January 31	111 00	
Salary of Dr. T. A. Davis, San Diego	13 35	
Salary of Dr. W. A. Weldon, San Pedro	60 00	
Telegraphy, Dr. Orme, Los Angeles	4 70	
Vaccine to Dr. Davis	6 00	
Feb. 1—Telegraphy bill	5 83	
Kirk, Geary & Co., vaccine	27 00	
Salary of Dr. Taggart, Tulare	100 00	
Salary of Dr. W. A. Weldon, San Pedro	100 00	
Salary of Dr. T. A. Davis, San Diego	100 00	
Salary of Dr. S. P. B. Knox, Santa Barbara	100 00	
Mar. 1—Telegraph bill	4 46	
Vaccine virus	17 00	
Traveling expenses of Dr. Orme	43 00	
May 1—Traveling expenses of Dr. Orme to Conference of Boards of Health	377 15	
Total	$2,506 10	
Balance	7,493 90	
Total	$10,000 00	$10,000 00

NAMES AND RESIDENCES OF CORRESPONDENTS

Of the State Board of Health for the years 1887 and 1888.

Dr. J. E. S. Baker	Angels Camp, Calaveras County.
Dr. S. C. Gibson	Anderson, Shasta County.
Dr. R. F. Rooney	Auburn, Placer County.
Dr. Samuel McCurdy	Azusa, Los Angeles County.
Dr. J. T. McLane	Alameda, Alameda County.
Dr. T. H. Mayon*	Amador City, Amador County.
Dr. Albert Fouch	Anderson, Shasta County.
Dr. J. H. Bullard	Anaheim, Los Angeles County.
Dr. J. M. Vance*	America, Santa Clara County.
Dr. J. M. Forrest	Alturas, Modoc County.
Dr. C. A. Rogers	Bakersfield, Kern County.
Dr. Edward Gray	Benicia, Solano County.
Dr. F. H. Payne	Berkeley, Alameda County.
Drs. O. C. Hawkins and W. R. Cleveland	Biggs, Butte County.
Dr. David Walker	Bodie, Mono County.
Dr. A. H. Rhea	Calico, San Bernardino County.
Drs. C. C. Mason and W. King	Chico, Butte County.
Dr. M. F. Price	Colton, San Bernardino County.
Dr. C. H. Gibbons	College City, Colusa County.
Dr. J. O. Smith	Cottonwood, Shasta County.
Dr. J. Parker	Castroville, Monterey County.
Drs. W. A. Patterson and B. Woodbridge	Cedarville, Modoc County.
Dr. R. S. Markell	Cloverdale, Sonoma County.
Dr. A. M. Gardner	Calistoga, Napa County.
Dr. H. N. Minor	Colfax, Placer County
Dr. E. J. R. de Turbeville*	Camptonville, Yuba County.
Dr. A. Trafton	Dixon, Solano County.
Dr. Alemby Jump	Downieville, Sierra County.
Dr. W. A. Brown	Downie, Los Angeles County.
Drs. A. C. Collins and W. E. Bates	Davisville, Yolo County.
Dr. E. W. Bathurst	Etna Mills, Siskiyou County.
Dr. J. A. McKee	Elk Grove, Sacramento County.
Dr. H. R. Bulson	Eureka, Humboldt County.
Dr. T. S. Ellis	Elsinore, San Diego County.
Dr. Paul Reudy	Forest Hill, Placer County.
Dr. G. M. Kober, U. S. A.	Fort Bidwell, Modoc County.
Dr. F. Durant	Folsom, Sacramento County.
Drs. A. J. Pedlar and Lewis Leach	Fresno, Fresno County.
Dr. M. M. Rowley	Fall River, Shasta County.
Dr. T. V. Goodspeed	Galt, Sacramento County.
Dr. W. C. Jones	Grass Valley, Nevada County.
Dr. C. A. E. Hertel	Gonzales, Monterey County.
Dr. J. R. Todd	Gridley, Butte County.
Dr. J. G. Cooper	Haywards, Alameda County.
Dr. H. V. Armistead	Hills Ferry, Stanislaus County.
Dr. J. A. Davidson	Hanford, Tulare County.
Dr. N. B. Coffman	Healdsburg, Sonoma County.
Dr. E. G. Camplin	Hollister, San Benito County.
Dr. H. G Pike	Hopland, Lake County.
Dr. H. Schaffer	Igo, Shasta County.
Dr. A. L. Adams	Ione, Amador County.
Dr. J. N. M. McGowan	Jolon, Monterey County.
Dr. E. B. Robertson	Jackson, Amador County.
Dr. J. H. Lowe	Knights Ferry, Stanislaus County.
Dr. W. S. Taylor	Livermore, Alameda County.
Drs. M. Hagan and J. M. Reese	Los Angeles, Los Angeles County.
Dr. J. Flint	Lincoln, Placer County.
Drs. D. W. White and L. Carpenter	Lakeport, Lake County.
Dr. L. M. Lovelace	Lemoore, Tulare County.
Dr. F. W. Colman	Lodi, San Joaquin County.

Dr. F. W. Knowles	Los Gatos, Santa Clara County.
Dr. E. N. Foote	Lockeford, San Joaquin County.
Dr. W. A. Craig	Lower Lake, Lake County.
Dr. David Powell	Marysville, Yuba County.
Dr. E. S. O'Brien	Merced, Merced County.
Dr. E. V. Jacobs	Meridian, Sutter County.
Dr. T. J. Stewart	Monrovia, Los Angeles County.
Dr. J. N. Crabb	Millville, Shasta County.
Dr. C. W. Evans	Modesto, Stanislaus County.
Dr. F. R. Brown	Madera, Fresno County.
Dr. W. J. Kearney	Mariposa, Mariposa County.
Dr. W. E. Robe	Maxwell, Colusa County.
Drs. A. Westfall and J. Hood	Monterey, Monterey County.
Dr. M. B. Pond	Napa, Napa County.
Drs. H. S. Welch and C. D. Bobo	Nevada City, Nevada County.
Dr. M. Schnabel	Newcastle, Placer County.
Dr. F. H. Hutchins	North Bloomfield, Nevada County.
Drs. Z. T. Magill and F. M. Stratton	Nicolaus, Sutter County.
Drs. E. W. Buck and D. D. Crowley	Oakland, Alameda County.
Dr. J. H. M. Karsner	Oroville, Butte County.
Dr. E. Chaffey	Ontario, San Bernardino County.
Dr. L. H. Patty	Petaluma, Sonoma County.
Dr. W. L. McAllister	Pasadena, Los Angeles County.
Dr. J. Q. Wrenn	Placerville, El Dorado County.
Drs. A. C. Smith and W. A. Norman	Plymouth, Amador County.
Drs. R. T. Burr and De Witt Crank	Pomona, Los Angeles County.
Dr. G. T. Mason	Redwood City, San Mateo County.
Dr. H. E. Stafford	Rocklin, Placer County.
Dr. John Fife	Red Bluff, Tehama County.
Drs. J. Allen and C. C. Sherman	Riverside, San Bernardino County.
Dr. Jackman	Roseville, Placer County.
Dr. H. L. Nichols	Sacramento, Sacramento County.
Drs. J. L. Meares* and D. E. Barger	San Francisco, San Francisco County.
Drs. T. L. Magee and D. Gochenauer	San Diego, San Diego County.
Dr. R. F. Winchester	Santa Barbara, Santa Barbara County.
Dr. E. H. Gould	Sonora, Tuolumne County.
Dr. W. A. Weldon	San Pedro, Los Angeles County.
Dr. C. L. Anderson	Santa Cruz, Santa Cruz County.
Drs. W. S. Thorne and F. K. Saxe	San José, Santa Clara County.
Dr. R. P. Smith, Jr.	Santa Rosa, Sonoma County.
Dr. D. H. Ketcham*	Santa Maria, Santa Barbara County.
Dr. J. R. Tully	Sierra City, Sierra County.
Dr. W. J. G. Dawson	St. Helena, Napa County.
Dr. G. W. Seifert	Santa Clara, Santa Clara County.
Dr. J. M. Briceland	Shasta, Shasta County.
Dr. T. R. Goodspeed	San Mateo, San Mateo County.
Dr. A. Milliken	Susanville, Lassen County.
Dr. H. J. Crumpton	Saucelito, Marin County.
Dr. J. M. Lacy	Santa Ana, Santa Barbara County.
Dr. E. E. Brown	Selma, Fresno County.
Dr. May Gydison	Salinas City, Monterey County.
Dr. A. C. Collins	San Bernardino, San Bernardino County.
Dr. W. W. Hayes	San Luis Obispo, San Luis Obispo County.
Dr. A. T. Hudson	Stockton, San Joaquin County.
Dr. W. Curless	Truckee, Nevada County.
Dr. Perry	Tehachapi, Kern County.
Dr. A. C. Winn	Tomales, Marin County.
Dr. J. L. Howell	Tulare, Tulare County.
Dr. H. P. Tartar	Tehama, Tehama County.
Dr. R. G. Reynolds	Upper Lake, Lake County.
Dr. W. A. King	Ukiah, Mendocino County.
Dr. W. F. Lynch	Volcano, Amador County.
Dr. W. D. Anderson	Vallejo, Solano County.
Dr. T. W. Pendergrass	Visalia, Tulare County.
Dr. A. J. Comstock	Ventura, Ventura County.
Dr. J. C. Montague	Weaverville, Trinity County.
Dr. W. D. Rodgers	Watsonville, Santa Cruz County.
Dr. Thos. Ross	Woodland, Yolo County.
Dr. A. W. Kimball	Williams, Colusa County.
Dr. L. Melton	Wheatland, Yuba County.
Dr. D. N. Mason	Willits, Mendocino County.
Dr. C. L. Gregory	Yreka, Siskiyou County.

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* Deceased.

REPORT OF DEATHS

From June 30, 1886, to June 30, 1887, of those Dying in the State of California.

Causes of Death.	Total	Sexes.			Ages.										Nativities.			
		Male	Female	Unascertained	Under 1 year	1 and under 5 years	5 and under 10 years	10 and under 20 years	20 and under 30 years	30 and under 40 years	40 and under 50 years	50 and under 60 years	60 and under 100 years	Unascertained	Pacific States	Atlantic States	Foreign Countries	Unascertained
I.—Zymotic or Epidemic.																		
Cholera	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Cholera morbus	9	5	3	1	----	----	----	----	----	1	2	1	4	1	1	4	4	----
Cholera infantum	216	92	92	32	136	37	3	----	1	----	----	----	----	39	207	4	4	1
Dysentery and Diarrhœa	118	50	39	29	46	23	1	2	4	8	6	4	11	13	72	16	17	13
Smallpox	18	10	5	3	2	3	2	1	4	1	1	----	1	3	3	9	3	3
Measles	34	18	13	3	9	17	1	1	1	----	----	1	----	4	28	2	2	2
Scarlatina	60	28	26	6	5	31	8	8	2	----	----	----	----	6	54	2	2	2
Diphtheria	376	170	188	18	15	164	124	44	10	1	4	----	1	13	317	25	15	19
Croup	164	79	72	13	13	100	33	7	----	----	----	----	----	11	153	4	2	5
Whooping cough	64	31	23	10	36	21	1	----	----	----	----	----	----	6	62	1	0	1
Erysipelas	26	16	8	2	6	2	1	2	2	4	2	3	4	----	11	6	5	4
Fevers—Typho-malarial	21	9	10	2	----	----	----	2	6	3	2	3	----	----	11	6	3	1
Typhoid	289	152	105	32	4	14	24	56	64	31	25	15	24	32	97	70	81	41
Remittent and Intermittent	43	23	16	4	3	7	1	4	5	6	2	7	4	4	16	16	8	3
Cerebro-spinal	92	43	36	13	29	19	8	6	4	5	3	3	4	11	65	11	9	7
Syphilis	26	14	12	----	10	----	----	----	9	----	2	3	1	----	9	4	10	3
Alcholism (direct or remote), including delirium tremens	112	76	22	14	----	----	----	----	6	12	24	28	18	24	6	35	56	15
II.—Constitutional Diseases.																		
Hydrocephalus	62	30	27	5	25	24	2	2	1	3	----	----	----	5	43	9	4	6
Meningitis	221	115	81	25	60	75	14	12	9	9	8	8	3	23	169	22	21	9
Phthisis pulmonalis	1,617	940	487	190	9	12	5	116	446	294	258	155	102	218	309	497	604	207
Marasmus	353	167	152	34	510	20	3	2	11	14	13	12	32	36	189	40	60	64
Scrofula	10	4	6	----	1	3	----	2	2	1	----	----	----	1	5	1	3	1
Rheumatism	33	16	15	2	----	----	----	1	5	2	2	9	14	----	5	7	19	2

Cancer	300	119	154	27	------	2	1	3	15	24	71	64	84	36	21	78	167	34
III.—LOCAL DISEASES.																		
Pneumonia	611	338	216	57	69	59	10	18	52	70	72	65	97	99	191	128	214	78
Pleurisy	21	14	7	------	------	------	------	------	4	2	7	4	4	------	------	6	15	------
Bronchitis	186	87	85	14	57	32	10	3	6	7	10	12	30	19	90	21	59	16
Other diseases of respiratory organs	124	70	44	10	24	10	5	1	12	15	15	13	15	14	43	28	39	14
Enteritis	162	89	66	7	87	18	3	5	8	10	7	8	7	9	106	16	31	9
Gastritis	74	27	41	6	17	5	------	1	4	6	7	14	14	6	27	10	29	8
Gastro-enteritis	7	5	1	1	3	2	------	------	------	------	1	------	------	1	6	1	------	------
Peritonitis (non-puerperal)	115	46	62	7	10	6	2	9	23	17	23	10	8	7	36	27	43	9
Diseases of the liver	125	70	50	5	10	1	------	2	11	7	22	36	33	3	14	32	72	7
Other diseases of stomach and bowels	63	27	25	11	6	4	2	2	7	2	8	4	19	9	19	16	22	6
Bright's disease and nephritis	165	96	57	12	3	2	3	9	19	17	35	32	31	14	23	37	79	26
Aneurism	39	24	8	7	------	1	------	------	3	1	14	8	5	7	1	11	20	7
Heart diseases	566	307	204	55	9	5	10	20	51	47	93	100	159	72	61	169	253	83
Convulsions	195	108	77	10	133	45	2	2	3	------	1	------	1	7	185	2	5	3
Other diseases of brain and nervous system	190	107	64	19	19	15	3	9	10	12	30	29	43	20	48	48	69	25
IV.—DEVELOPMENTAL DISEASES.																		
Puerperal diseases	33	------	33	------	------	------	------	1	15	9	3	------	1	4	6	9	12	6
Old age	193	78	98	17	------	------	------	------	------	------	------	------	193	------	1	53	99	40
V.—EXTERNAL CAUSES.																		
Suicide	122	99	15	8	------	------	------	2	12	30	31	21	8	18	7	23	66	26
Heat, death from—sunstroke	2	2	------	------	------	------	------	1	------	------	1	------	------	------	------	------	2	------
All other causes not classified	2,702	1,660	768	274	303	105	44	83	216	299	332	258	412	650	655	469	1,098	480
Stillbirths	357	196	138	23	------	------	------	------	------	------	------	------	------	------	357	------	------	------
Totals	10,316	5,667	3,641	1,008	1,369	885	327	439	1,065	970	1,138	930	1,387	1,445	3,729	1,975	3,326	1,286

REPORT OF DEATHS

From June 30, 1887, to June 30, 1888, of those Dying in the State of California.

Cause of Death.	Total	Sexes.			Ages.										Nativities.			
		Male	Female	Unascertained	Under 1 year	1 and under 5 years	5 and under 10 years	10 and under 20 years	20 and under 30 years	30 and under 40 years	40 and under 50 years	50 and under 60 years	60 and under 100 years	Unascertained	Pacific States	Atlantic States	Foreign Countries	Unascertained
I.—Zymodic or Epidemic.																		
Cholera																		
Cholera morbus	27	16	10	1	3	2	2				5	1	12	2	12	3	12	
Cholera infantum	253	135	99	17	209	32	1	2						7	237	8	5	1
Diarrhœa and Dysentery	132	75	48	9	41	24	5	1	7	5	10	6	23	10	71	25	30	6
Smallpox	94	66	27	1	6	5	3	9	26	16	7	13	5	4	20	31	34	9
Measles	139	59	66	14	38	69	11	4	4	4			1	8	114	20	4	1
Scarlatina	59	28	25	6	5	16	24	8	2					4	40	11	3	5
Diphtheria	358	174	163	21	14	172	93	35	5	2	1			36	283	49	15	11
Croup	203	106	85	12	24	115	47	9		1	2			5	182	13	1	7
Influenza	4	3	1		3	1									4			
Whooping cough	42	22	18	2	20	20	1							1	42			
Erysipelas	41	26	13	2	10		1	2	6	6	3	2	8	3	16	13	9	3
Fevers—Typho-malarial	29	12	13	4	2	6	1	2	7	5	2		3	1	17	9	2	1
Typhoid	414	242	156	16	1	40	37	94	115	42	30	10	14	31	165	109	110	30
Remittent and Intermittent	80	43	34	3	12	6	3	8	13	9	8	5	13	3	29	26	20	5
Cerebro-spinal	144	68	67	9	47	38	17	13	14	4	3		3	5	107	15	13	9
Syphilis	28	14	14		14				4	3	3			4	18	1	9	
Alcoholism (direct or remote), including delirium tremens	148	113	26	9			1		10	26	32	41	21	17	23	41	73	11
II.—Constitutional Diseases.																		
Hydrocephalus	24	12	10	2	16	6	1	1							23		1	
Meningitis	289	158	121	10	79	115	20	23	11	12	8	8	6	7	214	40	26	9
Phthisis pulmonalis	1,832	1,138	592	102	8	28	8	112	506	411	299	152	126	182	355	583	782	112
Marasmus	333	203	128	2	229	16	4	3	34	6	9	5	26	1	238	33	34	28
Scrofula	9	4	4	1	2	4		1		1				1	7		1	1
Rheumatism	22	15	7		1		2	2	2	3	5	1	6		2	8	12	

Cancer	317	151	160	6	------	------	------	------	11	25	79	77	107	18	24	108	167	18
III.—Local Diseases.																		
Pneumonia	1,039	625	373	41	125	175	49	56	96	88	127	113	153	57	391	234	381	33
Pleurisy	26	15	9	2	1	3	1	1	2	6	2	2	7	1	9	6	10	1
Bronchitis	262	131	121	10	80	65	5	8	6	11	20	21	36	10	132	42	81	7
Other diseases of respiratory organs	138	85	48	5	39	15	------	7	9	7	17	19	19	6	59	29	41	9
Enteritis	217	113	104	------	124	28	9	6	5	14	8	6	17	------	155	18	41	3
Gastritis	86	37	46	3	19	11	1	3	5	3	11	10	19	4	32	20	31	3
Gastro-enteritis	33	18	15	------	11	4	------	3	2	4	1	1	6	1	16	5	8	4
Peritonitis (non-puerperal)	124	56	68	------	4	4	6	14	25	22	13	12	20	4	34	31	56	3
Diseases of the liver	190	142	45	3	3	4	2	4	18	24	48	45	41	1	16	57	106	11
Other diseases of stomach and bowels	84	53	27	4	23	5	3	3	4	10	4	16	14	2	32	18	32	2
Bright's disease and nephritis	221	145	71	5	3	5	2	9	30	24	51	44	51	2	27	67	115	12
Aneurism	33	30	3	------	------	------	------	------	------	7	14	7	5	------	------	11	21	1
Heart diseases	694	423	234	37	16	9	10	34	59	74	113	119	202	58	101	194	369	30
Convulsions	237	137	99	1	152	66	7	1	1	2	2	1	3	2	215	16	------	6
Other diseases of brain and nervous system	243	142	90	11	31	27	9	3	13	21	40	27	65	7	63	79	81	20
IV.—Developmental Diseases.																		
Puerperal diseases	43	------	43	------	------	------	------	8	21	7	4	1	1	1	15	13	10	5
Old age	186	93	85	8	------	------	------	------	------	------	------	------	186	------	20	64	81	21
V.—External Causes.																		
Suicide	136	116	18	2	------	------	------	9	36	31	20	13	16	11	18	43	68	7
Heat, death from—sunstroke	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	----
All other causes not classified	2,980	1,896	925	159	335	121	53	108	296	273	418	257	550	569	856	812	1,078	234
Stillbirths	329	57	39	233	------	------	------	------	------	------	------	------	------	------	326	------	------	3
Totals	12,322	8,197	3,350	773	1,750	1,257	439	606	1,405	1,209	1,419	1,035	1,785	1,086	4,760	2,905	3,973	682

TABLE No. 1.

Number of Deaths, arranged according to Sexes, Months, and Ages, from June 30, 1886, to June 30, 1887.

Localities	Sexes.				Months.												Ages.										Number of Months Reported	Names of Correspondents
	Total	Male	Female	Unknown	July	August	September	October	November	December	January	February	March	April	May	June	Under 1 year	1 to 5 years	5 to 10 years	10 to 20 years	20 to 30 years	30 to 40 years	40 to 50 years	50 to 60 years	60 to 100 years	Unknown		
Alturas	16	9	7	0	0	3	1	1	0	0	1	4	1	0	3	2	0	3	1	2	2	1	2	2	0	3	12	Dr. J. M. Forrest.
Amador City	10	4	5	1	0	2	0	3	1	1	0	1	1	0	0	1	2	3	1	1	0	0	1	1	0	1	8	Dr. T. H. Mayon.
America	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	6	Dr. J. M. Vance.
Anaheim	24	11	10	3	0	2	3	3	4	2	3	0	1	0	4	2	4	3	0	3	2	1	3	0	5	3	12	Dr. J. H. Bullard.
Anderson	9	6	3	0	2	0	1	0	2	0	0	0	2	0	1	1	1	0	0	2	0	3	0	1	1	1	10	Dr. Albert Fouch
Angels Camp	32	23	6	3	4	2	1	3	4	0	0	8	3	5	1	1	4	4	1	1	1	4	4	3	8	2	12	Dr. J. E. S. Baker.
Arbuckle	10	5	5	0	0	0	0	2	0	1	2	2	0	0	2	1	1	1	0	2	3	1	0	1	1	0	6	Dr. C. H. Gibbons.
Auburn	22	11	8	0	4	1	0	0	1	4	2	2	2	1	1	4	0	3	0	1	7	3	1	4	2	1	12	Dr. R. F. Rooney.
Azusa	3	1	2	0	0	0	0	0	3	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2	0	0	3	Dr. S. McCurdy.
Bakersfield	28	23	5	0	4	0	1	3	2	2	1	3	2	4	6	0	3	1	0	2	4	3	3	8	3	1	11	Dr. C. A. Rogers.
Benicia	40	22	18	0	6	3	1	0	3	3	8	3	5	3	2	3	8	7	2	2	2	0	1	4	1	13	12	Dr. V. Newmark.
Berkeley	18	10	7	1	2	3	0	0	0	3	0	3	2	1	2	2	3	4	0	0	2	2	0	1	5	1	9	Dr. F. H. Payne.
Biggs	7	2	4	1	0	0	0	0	0	0	1	0	2	1	3	0	3	1	0	0	0	0	0	0	0	3	5	Dr. O. C. Hawkins.
Bodie	14	11	3	0	5	0	3	1	1	1	0	0	0	0	3	0	0	1	0	0	2	0	6	4	1	0	11	Dr. D. Walker.
Calico	7	5	2	0	0	0	1	1	0	0	2	2	1	0	0	0	1	0	0	0	0	0	2	2	1	1	8	Dr. A. R. Rhea
Calistoga	4	3	1	0	0	0	0	3	0	0	0	0	0	1	0	0	1	2	0	0	0	0	0	0	0	1	3	Dr. M. Gardner.
Camptonville	7	6	1	0	0	2	0	0	1	0	0	1	3	0	0	0	2	1	1	0	0	0	1	0	1	1	6	Dr. E. J. R. de Turberville.
Castroville	13	6	5	2	2	2	0	1	2	1	2	1	0	0	0	2	1	0	1	1	1	1	3	1	1	3	12	Dr. J. Parker.
Chico	91	41	46	4	6	10	5	4	9	11	8	6	11	6	7	7	9	14	0	4	5	6	13	10	13	17	12	Drs. C. C. Mason and O. Stansbury.
Cloverdale	28	19	9	0	2	0	2	6	3	0	3	1	2	4	2	3	1	1	1	3	1	3	0	5	3	10	11	Dr. R. S. Markell.
Colfax	7	1	5	1	1	1	1	0	0	2	0	0	0	2	0	0	0	0	0	0	1	1	0	0	1	4	6	Dr. H. N. Miner.
Colton	28	23	5	0	0	0	3	8	2	2	3	2	3	4	0	1	2	1	0	2	6	6	4	5	0	2	11	Dr. M. F. Price.
Cottonwood	4	2	2	0	0	0	1	0	0	1	0	0	0	1	1	0	2	1	0	0	1	0	0	0	0	0	12	Dr. J. O. Smith.
Crescent City	3	2	0	1	0	0	0	0	0	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	3	0	3	Dr. J. W. Robertson.
Davisville	13	6	3	4	2	0	0	0	0	3	1	1	1	2	2	1	2	1	0	0	0	1	0	3	5	1	12	Dr. A. C. Collins.
Dixon	13	4	5	4	1	1	1	1	1	1	1	1	0	1	2	2	3	0	0	1	2	1	1	1	3	1	12	Dr. A. Trafton.
Downey	7	6	1	0	0	0	0	0	0	0	0	0	3	1	3	0	1	1	0	0	0	0	0	0	0	5	4	Dr. W. A. Brown.
Downieville	8	3	3	2	0	0	0	2	0	2	2	1	0	0	0	1	1	1	0	0	0	0	1	1	2	2	5	Dr. A. Jump.
Elk Grove	7	0	0	7	3	1	0	0	1	0	0	1	0	0	0	1	0	0	1	1	2	0	0	2	1	1	6	Dr. J. A. McKee.
Etna Mills	51	30	21	0	5	8	10	8	7	5	3	0	2	0	1	2	1	6	0	2	4	1	1	3	2	31	12	Dr. E. W. Rathurst.
Eureka	61	37	19	5	6	4	5	9	7	7	0	0	10	5	0	8	3	6	3	3	4	4	16	7	12	3	9	Dr. H. R. Bulson.
Fall River	11	3	0	8	2	0	0	3	1	3	2	0	0	0	0	0	0	2	1	0	1	2	1	0	0	4	5	Dr. M. M. Rowley.
Folsom	12	5	4	3	5	0	2	0	0	0	0	2	0	2	1	0	1	0	0	0	2	3	2	0	1	3	6	Dr. F. Durant.
Fort Bidwell	8	3	5	0	0	0	1	0	0	0	0	1	1	3	2	0	0	5	1	1	0	0	1	0	0	0	5	Dr. G. M. Kober, U. S. A.
Fresno	77	52	21	4	7	1	5	2	1	7	4	8	7	9	11	15	12	2	0	5	11	7	1	6	8	23	12	Dr. Lewis Leach.
Forest Hill	14	6	5	3	0	0	0	0	0	1	2	2	3	0	3	3	0	0	2	0	2	0	0	3	3	4	12	Dr. Paul Reudy.
Galt	3	0	0	3	0	0	0	0	0	0	2	0	1	0	0	0	0	1	0	0	0	0	0	0	0	2	7	Dr. T. V. Goodspeed.
Gonzales	11	6	3	2	0	2	0	0	2	2	0	0	2	2	1	0	2	0	0	3	1	0	2	0	3	0	12	Dr. C. A. E. Hertel.
Grass Valley	72	42	30	0	9	8	3	6	5	2	9	6	7	8	6	5	5	2	3	1	4	5	5	7	7	33	12	Dr. W. C. Jones.
Gridley	18	6	8	4	3	0	1	0	0	3	6	0	0	0	5	0	2	4	0	0	1	0	1	0	3	7	5	Dr. J. R. Todd.
Hanford	44	18	26	0	2	2	2	5	8	3	2	5	4	1	3	4	10	8	1	3	4	4	4	0	4	6	12	Dr. J. A. Davidson.
Haywards	11	6	5	0	0	0	4	0	3	0	0	0	1	0	3	0	0	0	0	1	1	3	1	0	2	3	5	Dr. J. G. Cooper.
Healdsburg	54	16	20	18	5	5	5	5	2	4	5	6	10	2	2	3	1	4	0	0	1	0	1	0	1	46	12	Dr. N. B. Coffman.
Hill's Ferry	20	13	7	0	1	2	4	2	0	1	3	0	1	2	0	4	2	4	0	1	2	2	3	3	1	2	12	Dr. H. V. Armistead.
Igo	8	3	5	0	2	0	1	1	0	1	0	1	0	0	0	2	0	0	1	1	0	0	0	0	2	4	10	Dr. H. Schafer.
Ione	24	17	7	0	1	2	2	0	3	0	5	5	0	0	2	4	1	3	1	3	2	2	0	1	5	6	8	Dr. A. L. Adams.
Jackson	10	3	2	5	6	0	1	0	0	0	0	0	1	0	2	0	0	1	1	0	2	0	0	0	2	4	5	Dr. E. B. Robertson.
Jolon	17	6	9	2	1	1	0	3	3	3	2	2	1	0	0	1	3	1	1	1	0	1	0	1	2	7	12	Dr. J. N. M. McGowan.
Lakeport	16	2	1	13	0	2	1	2	0	4	5	0	2	0	0	0	1	3	1	0	0	0	1	2	0	8	6	Dr. D. W. White.
Lemoore	8	2	1	5	1	0	0	0	1	0	3	0	1	0	0	2	0	1	0	0	0	1	2	1	3	0	10	Dr. L. M. Lovelace.
Lincoln	8	1	2	5	0	0	0	1	0	1	0	0	3	1	0	2	0	2	0	0	1	0	0	0	5	0	12	Dr. Jos. Flint.
Livermore	29	18	11	0	7	0	4	0	2	8	1	0	0	1	1	5	5	3	1	0	9	4	4	1	2	0	12	Dr. W. S. Taylor.
Lockeford	2	0	1	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	2	2	Dr. E. N. Foote.
Lodi	13	9	4	0	0	0	1	2	2	0	0	4	0	2	0	2	1	2	0	0	0	1	1	0	6	2	8	Dr. F. W. Colman.
Los Angeles	574	149	113	312	27	29	49	30	40	45	70	45	94	55	58	40	74	41	17	23	93	0	52	0	28	246	12	Dr. J. S. Baker.
Los Gatos	15	7	8	0	0	1	2	0	1	0	5	0	3	0	3	0	0	1	0	1	1	2	1	2	3	4	9	Dr. F. W. Knowles
Mariposa	23	1	2	20	1	1	2	4	3	2	2	4	0	2	0	2	3	0	0	0	1	1	0	1	7	10	11	Dr. W. J. Kearney.
Marysville	88	48	29	11	7	14	5	11	8	13	0	7	5	5	10	3	1	4	1	2	9	17	6	12	11	22	11	Dr. David Powell.
Maxwell	7	1	5	1	0	0	0	0	0	0	6	0	0	0	1	0	0	2	2	0	1	0	1	0	0	1	3	Dr. W. E. Rohe.
Merced	34	13	8	13	0	0	6	7	0	3	3	2	3	4	4	2	0	3	0	2	1	5	6	4	1	12	9	Dr. E. S. O'Brien.
Martinez	25	18	3	4	0	6	4	3	1	0	3	0	5	1	2	0	3	3	4	0	2	1	1	5	1	5	10	Dr. J. Leffler.
Millville	12	2	2	8	3	0	1	0	1	0	0	1	2	0	2	2	1	2	1	0	2	2	0	1	2	1	8	Dr. J. N. Crabb
Modesto	33	22	11	0	8	6	6	0	0	0	6	7	0	0	0	0	0	0	0	0	0	0	0	0	0	33	5	Dr. C. W. Evans.
Monterey	15	8	6	1	0	1	1	0	1	1	1	0	4	2	1	3	0	4	1	2	1	1	1	1	4	0	10	Dr. A. Westhall.
Napa	54	34	20	0	5	7	4	4	3	3	6	6	2	4	4	6	5	2	1	5	1	4	2	2	4	28	12	Dr. H. M. Pond.
Nevada City	50	28	22	0	6	4	5	4	2	4	4	5	2	3	8	3	7	5	2	1	5	4	6	8	9	3	12	Dr. H. S. Welch.
Newcastle	5	1	0	4	0	0	0	0	0	2	0	1	1	0	1	0	1	0	0	0	0	0	0	1	2	1	12	Dr. M. Schnabel.
Nicolaus	9	3	5	1	1	1	0	0	1	0	1	0	1	1	1	2	2	1	0	0	0	3	1	1	1	0	12	Dr. Z. T. Magill.
Oakland	573	297	276	0	53	51	45	45	46	46	45	41	41	36	56	68	123	64	18	21	97	0	96	0	151	0	12	Dr. E. W. Buck.
Ontario	16	13	1	2	0	0	2	1	2	2	1	4	4	0	0	0	1	3	0	0	0	1	0	0	1	10	12	Dr. E. Chaffey.
Oroville	51	43	8	0	6	4	2	3	4	4	4	0	6	6	5	7	1	1	1	1	5	3	10	13	12	4	12	Dr. J. H. M. Karstner.
Pasadena	54	30	24	0	0	0	0	0	0	0	0	0	10	18	7	19	5	4	1	5	12	11	4	6	5	1	4	Dr. Theron Nichols.
Petaluma	65	34	31	0	4	9	9	6	5	6	5	4	9	3	0	5	5	7	2	6	7	3	7	6	21	1	11	Dr. L. H. Patty.
Placerville	39	22	17	0	0	0	1	2	3	5	5	4	4	2	8	5	1	1	0	4	1	1	3	6	12	10	10	Dr. J. Q. Wrenn.
Pomona	42	23	19	0	0	0	0	0	0	0	5	10	5	7	8	7	6	7	0	2	8	8	5	1	2	3	6	Dr. R. T. Burr.
Red Bluff	51	8	1	42	7	1	1	1	3	2	4	9	3	0	11	6	2	1	0	1	1	0	2	2	1	41	11	Dr. J. Fife.
Redding	13	7	6	0	0	0	0	0	1	0	1	2	1	0	3	5	5	6	0	0	0	0	0	0	2	0	11	Dr. J. H. Miller.
Redwood City	26	16	10	0	7	1	1	3	5	3	0	0	2	1	1	2	5	5	1	1	4	2	3	1	2	2	10	Dr. A. W. Gamble
Riverside	68	35	26	7	2	0	7	7	6	8	0	7	9	0	13	9	10	6	2	9	11	6	5	3	4	12	10	Drs. J. Allen and C. C. Sherman.
Rocklin	8	5	3	0	0	1	2	2	0	0	0	2	0	0	0	1	1	2	0	0	0	0	0	0	0	5	8	Dr. H. E. Stafford.
Sacramento	397	239	158	0	32	37	27	37	44	36	28	56	29	16	29	26	64	48	13	22	51	40	53	11	65	0	12	Dr. H. L. Nichols.
Salinas City	32	3	3	26	3	5	5	0	0	3	0	1	4	0	6	5	0	3	0	0	6	1	1	0	2	19	8	Dr. May Gydson.
San Diego	159	108	45	6	5	9	12	9	22	12	11	10	19	10	7	24	16	16	1	11	31	26	19	12	26	1	12	Drs. T. L. Magee and D. B. Northrup.
San Francisco	5,359	3,054	1,868	437	437	408	394	425	452	491	522	451	445	450	475	409	824	415	394	322	671	668	662	616	751	27	12	Dr. J. L. Meares.
San José	224	147	77	0	18	18	16	29	26	19	29	24	9	13	12	11	25	13	8	11	27	29	31	28	17	10	12	Dr. W. S. Thorne
Sierra City	18	13	4	1	1	5	2	2	1	2	3	2	0	0	0	0	1	1	0	1	1	1	2	4	1	3	8	Dr. F. Hutchins.
San Mateo	10	3	0	7	2	1	1	1	2	0	0	0	1	0	0	2	0	0	2	0	0	2	1	1	1	3	10	Dr. J. R. Goodspeed.
San Pedro	9	4	5	0	0	0	0	0	0	0	0	0	1	2	5	1	0	3	1	0	0	0	1	1	0	3	4	Dr. W. A. Weldon.
Santa Barbara	15	11	4	0	6	9	0	0	0	......	......	......	......	......	......	......	3	2	0	0	0	0	2	2	4	2	2	Dr. G. W. Collin.
Santa Clara	38	20	15	3	3	7	3	4	0	3	6	0	2	5	0	5	0	6	0	3	6	1	4	2	6	10	10	Dr. G. W. Seifert.
Santa Cruz	77	45	32	0	6	8	6	6	5	3	10	4	9	9	6	5	3	5	1	1	3	2	4	6	10	12	12	Dr. C. L. Anderson.
Santa Rosa	62	38	24	0	6	3	10	5	8	11	10	3	3	0	0	0	4	6	1	2	3	1	3	1	6	35	9	Dr. R. P. Smith, Jr.
Sausalito	2	0	1	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2	Dr. H. J. Crampton.
Selma	24	16	8	0	1	0	3	2	2	3	0	0	4	3	3	0	3	4	1	2	0	1	5	3	1	1	7	Dr. E. E. Brown.
Shasta	6	0	1	5	0	0	1	0	1	0	0	0	2	0	1	1	1	0	0	0	0	0	7	3	0	1	8	Dr. J. M. Brachand.
St. Helena	51	36	15	0	0	4	5	7	9	3	4	3	1	6	6	0	10	6	1	2	5	5	5	2	10	5	10	Dr. W. J. G. Dawson.
Stockton	175	97	71	7	13	9	14	18	17	13	17	18	22	11	14	9	27	22	6	11	10	17	18	11	31	13	12	Dr. A. T. Hudson.
Susanville	17	9	8	0	0	2	3	1	5	2	2	0	2	0	0	0	0	2	0	3	2	0	0	3	2	5	11	Dr. A. Milliken.
Sonora	46	32	9	5	0	0	0	0	0	1	5	5	5	9	10	8	0	1	0	0	0	1	1	1	2	10	7	Dr. E. T. Gould.
Tehama	9	4	3	2	2	0	0	0	1	1	0	1	0	0	2	2	0	1	2	1	0	1	0	0	2	2	8	Dr. H. P. Tartar.
Trinity County	17	7	4	6	3	1	1	2	1	0	2	1	1	2	0	0	0	2	0	2	1	1	1	4	6	0	12	Dr. J. C. Montague.
Tulare City	17	13	4	0	0	0	0	0	0	0	0	7	5	0	0	5	1	0	0	0	1	2	0	0	0	13	3	Dr. J. L. Howell.
Truckee	24	18	6	0	2	4	2	4	2	3	2	0	0	1	3	1	1	5	0	1	6	2	2	0	6	1	12	Dr. W. Curless.
Upper Lake	8	1	5	2	0	0	0	0	0	0	3	2	1	1	1	0	2	2	1	0	1	0	0	0	1	1	6	Dr. R. G. Reynolds
Ukiah	8	2	2	4	2	0	0	0	0	0	0	0	0	1	3	2	1	1	0	1	0	1	0	0	1	3	4	Dr. E. W. King
Visalia	43	17	8	18	4	2	0	2	2	0	8	7	6	5	4	3	12	0	1	1	2	1	7	3	1	22	12	Dr. T. W. Pendergrass.
Vallejo	79	39	21	19	5	7	7	5	9	9	6	5	9	7	6	4	17	5	3	3	8	5	13	11	14	0	12	Dr. W. D. Anderson.
Watsonville	32	12	14	6	1	0	1	6	3	5	3	5	2	1	3	2	1	3	0	1	2	1	1	1	0	22	12	Dr. W. D. Rodgers.
Williams	16	7	6	3	2	0	1	0	4	0	0	2	0	4	2	1	5	2	2	1	1	0	0	0	1	4	12	Dr. H. C. Crowder.
Willits	8	4	3	1	0	0	1	2	0	0	0	0	0	3	1	1	0	0	0	0	1	0	0	0	1	6	5	Dr. D. N. Mason.
Wheatland	11	1	3	7	2	0	0	0	0	1	1	3	1	1	2	0	1	0	0	0	0	0	1	0	3	6	9	Dr. L. Melton.
Woodland	37	20	17	0	3	7	0	2	3	3	3	4	5	2	4	1	5	7	0	4	2	5	6	2	5	1	12	Dr. Thos. Ross
Yreka	22	16	6	0	0	0	0	0	1	4	4	6	3	3	0	1	0	2	0	1	2	0	1	6	5	5	7	Dr. C. L. Gregory.
Miscellaneous	16	1	6	9	8	0	3	1	1	0	0	0	0	3	0	0	0	0	2	1	0	0	0	2	2	0	5	
Totals	10,113	5,477	3,500	1,136	814	756	758	804	847	880	950	876	904	799	900	825	1,395	903	518	451	1,213	971	1,173	935	1,150	1,046	......	

TABLE No. 2.

Number of Deaths from all causes, with the Sexes, Months, Ages, and Nativities, from June 30, 1886, to June 30, 1887.

Diseases.	Sexes.				Months.												Ages.										Nativities.			
	Total	Male	Female	Unascertained	July	August	September	October	November	December	January	February	March	April	May	June	Under 1 year	1 to 5 years	5 to 10 years	10 to 20 years	20 to 30 years	30 to 40 years	40 to 50 years	50 to 60 years	60 to 100 years	Unascertained	Pacific States	Atlantic States	Foreign	Unascertained
I.—Zymotic, or Epidemic.																														
Cholera morbus	9	5	3	1	0	2	0	4	0	0	0	1	0	0	2	0	0	0	0	0	0	1	2	1	4	1	1	4	4	0
Cholera infantum	216	92	92	32	46	35	26	16	11	9	4	3	1	5	15	45	136	37	3	0	1	0	0	0	0	39	207	4	4	1
Diarrhœa and Dysentery	118	50	39	29	18	18	6	14	3	9	5	4	4	6	16	15	46	23	1	2	4	8	6	4	11	13	72	16	17	13
Smallpox	18	10	5	3	0	0	0	0	0	0	0	3	11	2	0	2	2	3	2	1	4	1	1	0	1	3	3	9	3	3
Measles	34	18	13	3	0	0	0	5	3	4	3	4	4	5	3	3	9	17	1	1	1	0	0	1	0	4	28	2	2	2
Scarlatina	60	28	26	6	1	4	1	4	7	11	6	3	8	6	4	5	5	31	8	8	2	0	0	0	0	6	54	2	2	2
Diphtheria	376	170	188	18	12	20	17	30	47	55	54	33	23	32	31	22	15	164	124	44	10	1	4	0	1	13	317	25	15	19
Croup	164	79	72	13	7	7	8	11	20	34	23	17	18	8	4	7	13	100	33	7	0	0	0	0	0	11	153	4	2	5
Whooping-cough	64	31	23	10	8	9	4	7	4	0	4	5	6	5	7	5	36	21	1	0	0	0	0	0	0	6	62	1	0	1
Fevers—Typho-malarial	21	9	10	2	3	2	0	2	4	2	1	2	2	0	0	3	0	0	0	2	6	3	2	3	------	5	11	6	3	1
Typhoid	289	152	105	32	19	36	28	45	28	21	22	21	14	15	18	22	4	14	24	56	64	31	25	15	24	32	97	70	81	41
Remittent and Intermittent	43	23	16	4	4	14	2	4	2	5	0	2	1	5	1	3	3	7	1	4	5	6	2	7	4	4	16	16	8	3
Cerebro-spinal	92	43	36	13	7	7	9	8	12	4	7	10	5	6	13	4	29	19	8	6	4	5	3	3	4	11	65	11	9	7
Erysipelas	26	16	8	2	3	0	1	2	0	2	2	4	7	2	2	1	6	2	1	2	2	4	2	3	4	0	11	6	5	4
Syphilis	26	14	12	0	1	2	3	2	1	2	2	1	3	0	3	6	10	0	0	0	9	0	2	3	1	0	9	4	10	3
Alcoholism	112	76	22	14	11	11	8	8	11	5	15	5	10	8	11	9	0	0	0	0	6	12	24	28	18	24	6	35	56	15
II.—Constitutional Diseases.																														
Hydrocephalus	62	30	27	5	4	4	7	2	4	4	4	7	5	3	3	15	25	24	2	2	1	3	0	0	0	5	43	9	4	6
Meningitis	221	115	81	25	23	19	12	15	21	19	18	16	25	12	28	13	60	75	14	12	9	9	8	8	3	23	169	22	21	9
Phthisis pulmonalis	1,617	940	487	190	108	89	110	108	133	153	154	160	188	148	140	126	9	12	5	116	448	294	258	155	102	218	309	497	604	207
Marasmus	353	167	152	34	37	25	31	43	27	40	25	19	23	26	27	30	210	20	3	2	11	14	13	12	32	36	189	40	60	64
Scrofula	10	4	6	0	1	0	0	0	0	1	0	0	5	0	0	3	1	3	0	2	2	1	0	0	0	1	5	1	3	1
Rheumatism	33	16	15	2	3	3	0	2	3	5	5	3	4	1	3	1	0	0	0	1	5	2	2	9	14	0	5	7	19	2
Cancer	300	119	154	27	27	25	23	20	27	24	23	27	28	24	28	24	0	2	1	3	15	24	71	64	84	36	21	78	167	31
III.—Local Diseases.																														
Pneumonia	611	338	216	57	24	26	24	37	62	72	83	73	73	41	56	40	69	59	10	18	52	70	72	65	97	99	191	128	214	78
Pleurisy	21	14	7	0	0	2	1	1	2	3	2	3	2	1	2	2	0	0	0	0	4	2	7	4	4	0	0	6	15	0
Bronchitis	186	87	85	14	10	12	11	6	9	21	32	26	17	14	15	13	57	32	10	3	6	7	10	12	30	19	90	21	59	16
Other diseases of respiratory organs	124	70	44	10	10	9	7	8	6	7	19	12	10	14	15	7	24	10	5	1	12	15	15	13	15	14	43	28	39	14
Enteritis	162	89	66	7	11	25	18	13	12	7	8	6	11	14	18	19	87	18	3	5	8	10	7	8	7	9	106	16	31	9
Gastritis	74	27	41	6	4	3	7	8	7	6	5	8	9	9	2	6	17	5	0	1	4	6	7	14	14	6	27	10	29	8
Gastro-enteritis	7	5	1	1	3	0	0	0	2	0	0	1	1	0	0	0	3	2	0	0	0	9	1	0	0	1	6	1	0	0
Peritonitis (non-puerperal)	115	46	62	7	8	8	12	7	6	10	11	8	11	12	12	10	10	6	2	9	23	17	23	10	8	7	36	27	43	9
Diseases of the liver	125	70	50	5	4	10	12	17	8	11	11	8	10	15	12	7	10	1	0	2	11	7	22	36	33	3	14	32	72	7
Other diseases of stomach and bowels	63	27	25	4	5	4	3	6	9	9	5	3	4	7	6	2	6	4	2	2	7	2	8	4	19	9	19	16	22	6
Bright's disease, and nephritis	165	96	57	12	6	9	9	9	11	12	21	24	14	21	10	19	3	2	3	9	19	17	35	32	31	14	23	37	79	26
Aneurism	39	24	8	7	6	2	2	3	1	1	5	5	8	1	3	2	0	1	0	0	3	1	14	8	5	7	1	11	20	7
Heart diseases	566	307	204	55	43	59	34	31	40	39	54	41	64	60	58	43	9	5	10	20	51	47	93	100	159	72	61	169	253	83
Convulsions	195	108	77	10	5	18	12	15	19	15	14	14	17	22	29	15	133	45	3	2	3	0	1	0	1	7	185	2	5	3
Diseases of brain and nervous system	190	107	64	19	13	12	13	15	17	15	23	17	13	23	12	17	19	15	3	9	10	12	30	29	43	20	48	48	69	25
IV.—Developmental Diseases.																														
Puerperal diseases	33	0	33	0	3	1	1	2	3	6	2	4	7	0	2	2	0	0	0	1	15	9	3	0	1	4	6	9	12	6
Old age	193	78	98	17	7	18	13	16	20	15	31	15	18	14	14	12	0	0	0	0	0	0	0	0	193	0	1	53	99	40
V.—External Causes.																														
Suicide	122	99	15	8	10	8	9	5	13	12	8	10	7	13	12	15	0	0	0	2	12	30	31	21	8	18	7	23	66	26
Heat, death from—sunstroke	2	2	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	1	0	0	0	0	0	2	0
All other diseases not classified	2,702	1,660	768	274	268	239	206	237	227	217	240	222	191	194	231	230	303	105	44	83	216	299	332	258	412	650	655	469	1,098	480
Stillbirths	357	196	138	23	22	26	18	35	31	28	28	21	48	33	30	37	------	------	------	------	------	------	------	------	------	------	357	------	------	------
Totals	10,316	5,657	3,641	1,008	805	824	709	823	873	915	979	871	929	827	899	862	1,369	885	327	439	1,065	964	1,137	930	1,387	1,460	3,729	1,975	3,326	1,286

TABLE No. 3.

Number of Deaths, arranged according to Sexes, Months, and Ages, from June 30, 1887, to June 30, 1888.

Localities.	Sexes.				Months.												Ages.										Number of Months Reported	Names of Correspondents
	Total	Male	Female	Unascertained	July	August	September	October	November	December	January	February	March	April	May	June	Under 1 year	1 to 5 years	5 to 10 years	10 to 20 years	20 to 30 years	30 to 40 years	40 to 50 years	50 to 60 years	60 to 100 years	Unascertained		
Alturas	13	6	7	0	0	1	2	2	1	0	1	3	0	1	0	2	2	2	0	1	1	1	2	1	3	0	12	Dr J M Forrest
Amador City	9	5	3	1	3	5	0	0	1	0	0	0	0	0	0	0	0	4	0	1	0	0	1	0	0	3	5	Dr. T. H Mayon.
Anaheim	26	14	12	0	1	0	4	0	6	1	3	2	3	3	1	2	1	5	5	2	3	1	3	5	1	0	12	Dr. J H. Bullard.
Anderson	10	2	8	0	1	0	1	2	2	0	1	0	0	0	2	1	1	0	0	2	2	1	1	0	2	1	12	Dr A. Fouch.
Angels Camp	37	26	10	1	1	1	2	4	4	5	0	5	7	4	2	2	1	3	1	2	8	2	1	9	10	0	12	Dr. J. E Seymour Baker
Arbuckle	9	3	6	0	0	0	3	1	2	3	0	0	0	0	0	0	2	3	0	0	1	0	1	0	1	1	7	Dr C. H. Gibbons.
Auburn	13	9	4	0	1	1	0	1	0	1	0	2	2	2	1	2	0	2	1	0	3	1	1	1	2	2	12	Dr. R. F Rooney.
Azusa	5	3	2	0	0	0	0	0	0	0	0	3	0	0	0	2	0	0	0	1	0	1	0	1	1	1	12	Dr S. McCurdy.
Alameda	54	33	21	0	0	0	0	0	9	0	0	0	8	9	13	15	5	5	2	12	2	1	8	7	11	3	5	Dr. S. S Simmons.
Bakersfield	49	32	17	0	0	4	1	3	9	4	3	3	2	12	3	5	11	6	0	3	12	5	4	4	4	0	12	Dr. C A Rogers
Benicia	32	19	13	0	2	0	2	3	5	3	4	2	3	3	1	4	7	4	0	1	5	0	5	3	5	2	11	Dr E. Gray.
Berkeley	19	7	12	0	1	0	0	0	2	6	4	1	0	5	0	0	1	2	3	3	5	0	2	2	1	0	6	Dr F H Payne
Biggs	5	2	1	2	0	0	0	2	1	0	0	1	1	0	0	0	1	1	1	0	1	0	0	0	1	0	8	Dr. W R. Cleveland.
Bodie	6	4	2	0	0	1	1	0	0	1	0	0	0	3	0	0	0	1	0	0	0	1	2	1	0	0	12	Dr. D. Walker.
Brownsville	14	5	1	8	0	0	0	0	0	0	7	1	1	1	2	2	1	1	0	0	2	0	0	1	5	4	6	Dr. L. C Crossman
Calico	10	8	2	0	0	0	0	1	2	1	1	2	1	1	1	0	1	5	1	1	0	1	1	0	0	0	10	Dr. A R. Rhea.
Calistoga	14	10	4	0	0	2	0	3	0	0	3	0	4	2	0	0	3	0	0	0	1	0	1	0	0	9	6	Dr A M. Gardner.
Castroville	10	3	3	4	2	0	2	0	0	4	0	0	0	0	2	0	0	0	0	0	0	1	1	0	1	7	9	Dr J. Parker.
Chico	74	44	29	1	11	5	1	9	9	0	4	13	9	1	4	8	7	8	1	6	6	5	5	7	8	21	11	Drs O. Stansbury and W. King.
Cloverdale	17	6	10	1	0	0	0	1	2	3	1	2	1	3	2	1	2	2	2	2	0	1	0	0	4	3	12	Dr. R S Markell
Colfax	10	5	5	0	1	0	0	1	0	0	0	0	2	0	3	3	5	2	0	2	0	0	0	0	1	0	9	Dr H. N. Miner.
Colton	40	17	23	0	0	1	1	1	6	3	9	6	7	4	2	0	4	5	1	1	9	6	1	3	3	7	11	Dr. M. F Price.
Cottonwood	15	4	8	3	3	1	0	1	1	1	1	1	1	1	4	0	7	4	0	2	0	0	1	0	1	0	12	Dr. J O. Smith.
Cedarville	15	10	4	1	0	0	0	1	2	4	0	1	2	3	0	1	0	1	0	0	0	1	1	1	2	7	8	Dr B. Woodbridge.
Davisville	7	5	2	0	2	0	0	1	0	0	1	0	0	1	0	2	2	0	0	0	0	1	2	0	1	3	12	Drs A C. Collins and W. E. Bates.
Dixon	11	8	3	0	1	1	1	0	1	2	0	1	1	1	1	1	4	0	0	1	0	3	0	3	0	0	12	Dr A Trafton.
Downey	30	8	7	15	2	3	1	3	4	4	4	0	2	0	4	3	2	4	0	1	0	1	0	2	1	19	10	Dr W A Brown
Downieville	12	7	3	2	0	1	1	3	2	0	2	0	1	0	0	2	0	0	0	0	4	0	0	2	3	3	12	Dr A Jump
Elk Grove	12	4	6	2	0	0	1	2	2	0	3	0	0	1	2	1	0	1	0	1	2	0	2	0	1	5	12	Dr J A McKee
Elsinore	9	1	0	8	0	0	0	0	4	2	1	2	0	0	0	0	1	0	0	0	4	3	0	0	1	0	6	Dr T E Ellis
Etna Mills	38	19	8	11	0	0	11	7	5	1	3	5	3	1	2	0	0	1	0	4	1	3	2	2	1	21	10	Dr. E W Bathurst
Eureka	52	33	19	0	0	4	0	5	4	5	9	7	4	14	0	0	0	7	4	3	5	5	11	6	9	7	9	Dr. H R. Bulson
Forest Hill	12	11	1	0	2	1	0	0	2	0	3	1	0	2	0	1	2	2	0	1	0	0	1	2	3	1	9	Dr Paul Reudy
Fort Bidwell	5	4	1	0	0	0	0	1	1	0	0	1	0	2	0	0	1	0	2	0	1	0	0	0	1	0	6	Dr. G M Kober, U. S. A.
Fresno	101	66	35	0	7	5	7	6	8	14	11	9	5	14	9	6	10	15	4	9	10	10	11	10	16	6	12	Dr Lewis Leach
Galt	3	0	0	3	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	2	Dr. T. V. Goodspeed
Gonzales	14	6	8	0	1	0	0	6	3	0	0	0	1	2	0	1	2	3	1	0	1	1	2	0	0	4	11	Dr. C. A E. Hertel.
Grass Valley	87	59	28	0	6	4	8	12	11	5	5	2	6	14	7	7	7	6	3	6	3	4	2	10	8	38	12	Dr W. C Jones
Gridley	9	0	1	8	0	0	0	0	2	0	2	1	0	2	1	1	1	3	0	0	0	1	0	0	3	0	9	Dr. J. R. Todd.
Hanford	22	14	6	2	2	2	1	0	1	0	7	0	3	3	3	0	4	6	1	1	3	0	2	4	1	0	10	Dr. J A Davidson
Haywards	14	9	4	1	0	1	1	4	2	2	1	1	2	0	0	0	1	1	0	3	1	0	0	1	5	2	8	Dr J. G Cooper.
Healdsburg	33	2	2	29	0	4	5	4	0	5	0	0	2	2	8	3	2	0	1	1	0	0	1	0	5	23	9	Dr N B. Coffman.
Hills Ferry	12	9	3	0	2	0	0	1	3	1	1	1	0	1	1	1	0	2	0	1	5	0	0	0	4	0	12	Dr. H. V. Armistead.
Hopland	5	3	2	0	0	1	0	0	0	0	0	0	2	0	2	0	0	1	0	0	0	0	1	1	0	2	12	Dr H G. Pike.
Igo	2	1	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	12	Dr H Schafer
Ione	8	5	3	0	0	0	0	3	0	0	0	3	2	0	0	0	0	0	0	0	1	0	0	0	4	3	3	Dr A. L. Adams
Jackson	22	12	8	2	0	0	0	1	0	0	2	2	7	5	5	0	1	6	0	0	0	0	0	1	2	12	6	Dr E B Robertson.
Jolon	10	5	3	2	1	2	1	1	1	0	0	1	2	1	0	0	3	0	0	1	0	0	2	0	0	4	11	Dr. J. N. M. McGowan.
Knights Ferry	10	9	1	0	0	0	1	0	3	0	1	1	2	1	0	1	1	2	0	0	0	0	1	0	6	0	12	Dr. J. H. Lowe.
Lakeport	13	2	11	0	0	0	0	0	2	4	1	2	0	2	1	1	0	1	0	3	1	0	2	1	1	4	8	Dr. L Carpenter.
Lemoore	22	7	1	14	1	1	0	0	2	2	5	0	1	1	4	2	1	3	1	0	4	2	2	2	5	3	11	Dr L M. Lovelace.
Lincoln	17	6	2	9	1	0	0	2	2	0	2	1	4	3	1	1	2	1	1	1	3	0	3	0	6	0	10	Dr J Flint
Livermore	24	13	11	0	0	0	2	2	4	3	2	3	3	1	3	1	2	2	1	3	3	2	2	6	3	0	12	Dr W S Taylor.
Lockeford	11	4	3	4	0	0	0	2	2	2	2	0	0	1	2	0	2	1	0	0	0	0	1	0	0	7	9	Dr. E N Foote
Lodi	11	5	5	1	1	0	0	4	1	0	1	3	1	0	0	0	2	1	0	0	2	0	1	3	2	0	7	Dr. F. W Colman
Los Angeles	642	326	316	0	47	47	47	45	50	61	70	55	64	56	60	40	112	76	38	45	175	0	115	0	81	0	12	Drs M Hagan and J. M Reese
Los Gatos	16	9	7	0	0	0	0	1	0	0	4	4	5	0	2	0	1	3	3	0	2	0	0	0	0	7	6	Dr. F. W Knowles.
Lower Lake	9	4	3	2	0	0	0	1	1	1	1	1	1	1	2	0	2	0	0	1	0	0	0	0	0	6	9	Dr. M A Craig.
Mariposa	14	1	2	11	0	2	1	1	0	2	3	1	0	1	1	2	1	0	0	0	1	0	2	0	5	5	12	Dr W J Kearney
Marysville	73	51	22	0	2	6	6	5	16	5	8	9	7	5	3	7	4	2	1	0	8	11	16	15	15	1	12	Dr D. Powell.
Maxwell	14	8	6	0	0	0	0	0	0	4	7	3	0	0	0	0	0	8	1	1	0	3	0	0	1	0	3	Dr. W E Robe.
Merced	36	24	11	1	6	6	5	7	0	4	1	2	0	3	2	0	1	2	0	0	4	5	7	6	3	8	12	Dr E S O'Brien
Martinez	32	12	20	0	1	4	10	4	13	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	29	5	Dr. W Bolton
Millville	10	3	2	5	0	0	0	1	0	1	0	0	1	4	1	2	1	3	1	1	1	2	0	1	0	0	12	Dr J. N. Crabb.
Modesto	40	31	9	0	0	5	10	5	14	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	5	Dr C W. Evans
Monterey	69	38	31	0	4	5	0	12	14	4	9	4	6	2	9	0	10	9	1	3	4	7	3	6	10	7	11	Dr J. Hood.
Napa	65	41	17	7	5	5	7	7	11	7	9	5	0	4	0	5	2	1	1	3	5	2	1	8	9	33	10	Dr M B Pond
Nevada City	52	30	14	8	5	5	3	5	6	4	8	2	1	7	3	3	1	3	0	1	5	3	6	11	11	11	12	Dr H S. Welch.
Newcastle	10	3	1	6	0	0	1	0	1	0	4	4	0	0	0	0	0	1	1	1	1	1	1	1	1	2	9	Dr M Schnabel
Nicolaus	15	9	6	0	2	3	2	3	1	0	1	2	1	0	0	0	1	2	4	2	0	0	1	4	1	0	9	Dr Z T. Magill.
North Bloomfield	8	6	2	0	0	2	0	1	0	0	1	0	4	0	0	0	0	0	0	0	1	2	0	0	1	4	9	Dr F Hutchins.
Oakland	670	372	298	0	0	40	17	57	60	53	71	63	64	62	67	77	123	76	31	37	90	0	161	0	152	0	11	Dr. D D. Crowley.
Ontario	20	10	3	7	3	0	1	0	2	6	3	4	0	0	0	1	1	3	0	1	1	0	0	0	3	11	12	Dr E Chaffy.
Oroville	55	41	13	1	4	3	2	3	5	6	5	4	10	4	5	4	4	0	1	1	6	7	6	7	23	0	12	Dr J H M Karsner.
Pasadena	210	106	101	3	8	4	9	14	16	26	36	19	19	20	19	20	17	10	1	2	19	12	8	4	5	132	12	Dr W L McAllister
Petaluma	52	29	23	0	6	7	5	5	2	8	6	5	6	0	0	2	7	1	1	8	6	6	6	3	11	0	10	Dr L. H Patty.
Placerville	67	49	18	0	4	3	6	7	4	6	9	7	7	3	5	6	4	5	1	4	6	4	5	10	21	7	12	Dr. J Q. Wrenn.
Pomona	82	37	45	0	3	9	8	8	9	11	0	0	7	10	10	7	11	12	5	6	15	12	5	6	8	3	10	Drs R T Burr and DeWitt Crank.
Red Bluff	59	37	19	3	5	2	1	9	5	4	4	9	3	0	11	6	10	3	3	3	8	6	2	12	4	8	11	Dr J. Fife.
Redding	18	9	9	0	1	0	3	8	3	0	0	0	3	0	0	0	1	7	0	2	0	0	1	0	1	6	6	Dr J H Miller.
Redwood City	13	6	7	0	0	0	0	5	0	0	5	2	1	0	0	0	0	4	0	0	0	0	1	0	0	8	6	Dr G. T Mason
Riverside	98	54	41	3	3	6	7	4	7	19	12	10	10	4	10	6	15	15	3	1	15	16	10	9	10	1	12	Dr C C Sherman.
Rocklin	10	5	4	1	1	0	1	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	1	0	0	9	12	Dr H E Stallard.
Sacramento	451	238	213	0	34	37	27	40	29	41	51	45	43	28	42	31	61	55	26	34	91	0	107	0	77	0	12	Dr H. L. Nichols.
Salinas City	58	11	9	38	5	7	4	3	5	3	7	5	3	5	5	6	5	9	2	3	1	1	2	0	5	30	12	Dr May Gydhson
San Diego	466	286	180	0	12	20	19	25	28	41	75	60	45	40	42	47	69	53	15	23	78	73	51	32	53	19	12	Dr. D. B Northrup.
San Francisco	6,037	3,880	2,157	0	459	409	427	486	534	582	650	517	488	502	504	479	1,056	615	230	265	606	825	784	666	981	9	12	Drs J L Mears and D. E Burger.
San José	288	145	112	31	14	15	18	27	28	30	22	20	31	29	30	24	45	26	6	10	22	22	32	35	44	16	12	Drs. W S Thorne and F K Saxe.
San Luis Obispo	9	3	1	5	0	5	0	2	2	1	0	0	0	0	0	0	2	4	0	1	0	0	1	0	0	1	3	Dr. W W Hayes.
Sierra City	15	13	1	1	0	0	0	0	1	3	5	1	1	2	2	0	3	2	1	0	1	0	1	5	0	2	8	Dr J J Tully
San Mateo	4	0	0	4	0	0	0	4	0	0	0	0	0	0	0	0	0	1	0	0	2	1	0	0	0	0	1	Dr. J. R Goodspeed.
San Pedro	22	16	3	3	1	6	1	1	8	2	1	2	0	0	0	0	2	1	0	0	1	2	2	0	2	129	9	Dr. W A Weldon
Santa Ana	151	73	56	22	0	0	22	11	17	12	17	17	18	8	11	18	20	12	4	8	15	0	5	6	19	53	10	Dr. J M Lacey
Santa Barbara	105	58	47	0	2	8	3	0	0	0	20	17	19	18	4	14	10	12	4	8	13	16	9	10	19	4	9	Dr. R. F Winchester.
Santa Clara	56	29	23	1	3	1	0	9	8	4	1	7	4	2	7	7	6	4	0	2	3	3	3	4	5	26	11	Dr G W Seifert.
Santa Cruz	81	40	34	7	5	6	2	7	11	8	13	7	7	5	6	4	1	5	0	2	7	0	1	4	6	55	12	Dr. C L Anderson.
Santa Rosa	53	29	19	5	5	4	3	2	7	7	5	0	8	4	5	3	1	4	0	3	2	4	5	5	6	23	11	Dr R. P Smith, Jr.
Sausalito	4	1	1	2	0	0	0	0	0	0	2	2	0	0	0	0	1	1	0	1	0	0	0	0	1	0	4	Dr H J. Crumpton.
Selma	23	14	9	0	2	0	0	0	6	7	4	0	0	0	3	11	5	8	4	3	4	3	2	1	3	0	6	Dr E E Brown.
Shasta	14	0	0	11	1	2	4	2	1	0	0	0	1	1	1	1	0	0	0	0	0	1	0	6	5	2	12	Dr. J. M Brieland.
Sisson	20	11	6	3	0	0	0	2	0	4	0	3	3	2	2	4	0	3	1	0	2	4	1	1	0	8	8	Dr. E C Rhodes.
St Helena	52	31	21	0	3	3	4	2	11	4	2	2	2	0	5	5	3	2	3	8	5	5	8	7	8	3	12	Dr. W J. G. Dawson.
Stockton	148	81	64	3	9	7	13	17	14	15	12	13	12	13	9	14	16	8	8	9	17	18	14	20	35	3	12	Dr. A T Hudson.
Susanville	11	7	4	0	2	1	0	2	0	1	2	0	3	0	0	0	0	0	0	2	3	0	0	0	0	6	9	Dr. A Milliken.
Sonora	47	35	12	0	5	8	6	5	8	2	5	2	1	0	3	2	0	1	1	0	1	1	2	0	2	39	12	Dr E T Gould.
Tehachapi	11	1	5	5	0	2	0	0	0	0	5	1	1	0	2	0	1	2	1	0	0	1	1	0	2	3	6	Dr M Perry
Trinity County	27	17	7	3	0	6	0	0	2	1	2	4	3	3	3	3	0	0	0	1	2	0	1	4	9	10	12	Dr. J. C Montague.
Tulare City	27	18	9	0	0	0	0	0	0	6	3	6	5	0	0	7	7	2	0	0	0	5	5	2	0	6	5	Dr. J L Howell.
Truckee	16	7	5	4	2	1	0	2	0	1	2	0	2	1	4	1	5	0	4	0	0	5	0	2	0	0	12	Dr W Curless
Ukiah	12	6	5	1	0	0	0	3	3	0	1	1	0	2	1	1	0	0	0	0	0	2	1	0	2	7	8	Dr E W King
Vallejo	121	69	52	0	12	6	6	0	1	9	10	28	8	5	5	2	1	0	5	5	23	15	7	11	19	16	12	Dr W D. Anderson
Visalia	20	4	4	12	0	1	0	3	2	0	1	4	2	0	6	1	0	2	0	1	2	0	1	2	2	10	8	Dr. T W Pendergrass.
Ventura County	94	8	3	83	0	4	10	10	12	0	11	11	5	14	14	0	0	1	1	0	2	1	0	2	1	86	9	Dr W D. Rodgers.
Watsonville	42	18	17	7	6	1	4	2	5	2	10	2	4	4	2	2	0	6	0	0	1	0	0	1	0	37	12	Dr L. Melton.
Wheatland	17	6	2	9	2	2	1	1	1	2	3	1	0	1	2	1	0	1	2	0	2	2	0	2	3	5	12	Dr A W Kimball.
Williams	13	5	8	0	0	0	3	1	2	1	1	0	0	3	2	0	2	3	0	1	1	1	1	1	2	1	12	Dr D N Mason.
Willits	5	0	0	5	0	0	0	1	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5	Dr Thos Ross.
Woodland	35	22	13	0	2	0	5	7	2	5	3	4	2	1	2	2	8	3	3	3	6	2	2	4	0	4	12	Dr. C L. Gregory.
Yreka	36	24	12	0	2	3	5	7	1	4	4	1	2	1	3	0	0	1	1	7	5	3	3	4	9	3	12	Dr. A. J. Comstock.
Miscellaneous	58	21	20	17	8	12	0	5	9	2	6	0	8	5	4	0	2	10	1	1	1	1	1	2	1	38	9	
Totals	12,271	7,171	4,578	482	707	787	831	1,029	1,141	1,133	1,389	1,108	1,055	1,065	1,050	966	1,808	1,246	458	610	1,411	1,193	1,398	1,022	1,777	1,258		

TABLE No. 4.

Number of Deaths from all Diseases, with the Sexes, Months, Ages, and Nativities, from June 30, 1887, to June 30, 1888.

Diseases.	Sexes.				Months.												Ages.										Nativities.			
	Total	Male	Female	Unascertained	July	August	September	October	November	December	January	February	March	April	May	June	Under 1 year	1 to 5 years	5 to 10 years	10 to 20 years	20 to 30 years	30 to 40 years	40 to 50 years	50 to 60 years	60 to 100 years	Unascertained	Pacific States	Atlantic States	Foreign	Unascertained
I.—ZYMOTIC, OR EPIDEMIC.																														
Cholera morbus	27	16	10	1	1	2	1	6	2	1	1	2	1	3	4	3	3	2	2	0	0	0	5	1	12	2	12	3	12	0
Cholera infantum	253	135	99	17	34	18	26	51	25	8	5	4	3	7	24	47	209	32	1	2	0	0	0	0	0	7	237	8	5	3
Diarrhœa and Dysentery	132	75	48	9	14	10	4	23	29	15	6	8	1	1	7	14	41	24	5	1	7	5	10	6	23	10	71	25	30	6
Smallpox	94	66	27	1	3	1	1	2	4	12	36	13	14	6	2	......	6	5	3	9	26	16	7	13	5	4	20	31	34	9
Measles	139	59	66	14	4	1	1	7	4	18	35	23	25	13	6	2	38	69	11	4	4	4	0	0	1	8	114	20	4	1
Scarlatina	59	28	25	6	4	0	3	1	2	3	10	5	9	4	9	9	5	16	24	8	2	0	0	0	0	4	40	11	3	5
Diphtheria	358	174	163	21	25	20	24	28	38	33	40	38	23	32	36	21	14	172	93	35	5	2	1	0	0	36	283	49	15	11
Croup	203	105	85	12	9	9	14	21	30	32	28	14	17	9	12	8	24	115	47	9	0	1	2	0	0	5	182	13	1	7
Influenza	4	3	1	0	0	0	0	4	0	0	0	0	0	0	0	0	3	1	0	0	0	0	0	0	0	0	4	0	0	0
Whooping cough	42	22	18	2	5	5	2	4	2	4	0	1	3	9	2	5	20	20	1	0	0	0	0	0	0	1	42	0	0	0
Erysipelas	41	26	13	2	0	1	2	1	5	5	6	2	6	8	4	1	10	0	1	2	6	6	3	2	8	3	16	13	9	3
Fevers—Typho-malarial	29	12	13	4	5	......	5	5	1	7	0	3	1	0	2	0	2	6	1	2	7	5	2	0	3	1	17	9	2	1
Typhoid	414	242	156	16	16	31	29	33	57	59	58	23	18	24	29	37	1	40	37	94	115	42	30	10	14	31	165	109	110	30
Remittent and Intermittent	80	43	34	3	6	2	5	5	8	9	10	6	9	9	4	7	12	6	3	8	13	9	8	5	13	3	29	26	20	5
Cerebro-spinal	144	68	67	9	10	9	7	17	4	19	6	16	22	14	14	6	47	38	17	13	14	4	3	0	3	5	107	15	13	9
Syphilis	28	14	14	0	1	4	0	1	1	3	4	5	3	1	3	2	14	0	0	0	4	3	3	1	0	4	18	1	9	0
Alcholism	148	113	26	9	6	12	16	12	14	18	24	12	7	12	5	10	0	0	1	0	10	26	32	41	21	17	23	41	73	11
II.—CONSTITUTIONAL DISEASES.																														
Hydrocephalus	24	12	10	2	1	2	1	4	1	2	1	0	2	3	5	2	16	6	1	1	0	0	0	0	0	0	23	0	1	0
Meningitis	289	158	121	10	2	17	23	13	27	18	27	32	35	37	26	32	79	115	20	23	11	12	8	8	6	7	214	40	26	9
Phthisis pulmonalis	1,832	1,138	592	102	94	106	101	128	157	179	185	167	179	197	174	162	8	28	8	112	506	411	299	152	126	182	355	583	782	112
Marasmus	333	203	128	2	33	16	25	41	34	32	36	19	19	18	32	28	229	16	4	3	34	6	9	5	26	1	238	33	34	28
Scrofula	9	4	4	1	0	1	0	3	0	0	0	0	4	1	0	0	2	4	0	1	0	1	0	0	0	1	7	0	1	1
Rheumatism	22	15	7	0	3	3	1	2	3	2	1	3	0	0	1	3	1	0	2	2	2	3	5	1	6	0	2	8	12	0
Cancer	317	151	160	6	22	25	25	24	33	32	25	29	34	25	29	14	0	0	0	0	11	25	79	77	107	18	24	108	167	18
III.—LOCAL DISEASES.																														
Pneumonia	1,039	625	373	41	38	35	26	58	110	123	192	116	116	88	71	66	125	175	49	56	96	88	127	113	153	57	391	234	381	33
Pleurisy	26	15	9	2	2	0	3	5	1	3	0	2	3	3	2	2	1	3	1	1	2	6	2	2	7	1	9	6	10	1
Bronchitis	262	131	121	10	8	12	17	11	16	28	45	37	28	19	25	16	80	65	5	8	6	11	20	21	36	10	132	42	81	7
Other diseases of respiratory organs	138	85	48	5	7	6	4	10	22	18	18	6	14	10	13	10	39	15	0	7	9	7	17	19	19	6	59	29	41	9
Enteritis	217	113	104	0	18	15	14	21	25	9	19	15	16	15	26	24	124	28	9	6	5	14	8	6	17	0	155	18	41	3
Gastritis	86	37	46	3	2	9	8	9	19	4	6	7	7	6	5	4	19	11	1	3	5	3	11	10	19	4	32	20	31	3
Gastro-enteritis	33	18	15	0	5	2	5	2	2	1	0	2	1	1	4	8	11	4	0	3	2	4	1	1	6	1	16	5	8	4
Peritonitis (non-puerperal)	124	56	68	0	8	11	8	10	12	7	10	11	15	12	13	7	4	4	6	14	25	22	13	12	20	4	34	31	56	3
Diseases of the liver	190	142	45	3	13	12	10	13	14	20	26	18	13	15	21	15	3	4	2	4	18	24	48	45	41	1	16	57	106	11
Other diseases of stomach and bowels	84	53	27	4	6	2	1	2	12	7	12	6	3	7	14	12	23	5	3	3	4	10	4	10	14	2	32	18	32	2
Bright's disease, and nephritis	221	145	71	5	10	20	13	14	17	21	19	26	24	23	18	16	3	5	2	9	30	24	51	44	51	2	27	67	115	12
Aneurism	33	30	3	0	0	4	6	2	7	1	1	4	4	2	1	1	0	0	0	0	0	7	14	7	5	0	0	11	21	1
Heart diseases	694	423	234	37	47	48	42	51	65	70	82	48	63	64	47	67	16	9	10	34	59	74	113	119	202	58	101	194	369	30
Convulsions	237	137	99	1	13	14	14	22	16	22	23	17	23	21	30	22	152	66	7	1	1	2	2	1	3	2	215	16	0	6
Diseases of brain and nervous system	243	142	90	11	22	19	26	25	18	13	28	24	25	20	9	14	31	27	9	3	13	21	40	27	65	7	63	79	81	20
IV. DEVELOPMENTAL DISEASES.																														
Puerperal diseases	43	0	43	0	6	2	2	1	1	2	2	13	3	4	4	3	0	0	0	8	21	7	4	1	1	1	15	13	10	5
Old age	186	93	85	8	14	8	14	1	14	19	23	23	22	13	17	18	0	0	0	0	0	0	0	0	186	0	20	64	81	21
V.—EXTERNAL CAUSES.																														
Suicide	136	116	18	2	10	7	16	9	6	13	14	11	13	16	13	8	0	0	0	9	36	31	20	13	16	11	18	43	68	7
Heat, death from—sunstroke																														
All other diseases not classified	2,980	1,896	925	159	234	203	275	259	260	231	271	253	225	266	262	241	335	121	53	108	296	273	418	257	550	569	856	812	1,078	234
Stillbirths	329	57	39	233	7	5	4	39	30	50	15	32	52	42	28	25	0	0	0	0	0	0	0	0	0	0	326	0	0	3
Totals	12,322	8,197	3,350	773	767	730	817	1,000	1,148	1,173	1,350	1,096	1,104	1,080	1,053	992	1,750	1,257	439	606	1,405	1,209	1,419	1,035	1,785	1,086	4,760	2,905	3,973	685

APPENDIX.

The Board of Health, while generally approving the papers presented in this report, are not responsible for the particular sentiments expressed.

BOARD OF HEALTH.

SMALLPOX IN LOS ANGELES IN 1887.

By H. S. Orme, M.D., President State Board of Health.

The beginning of the year 1887, in our beautiful city of Los Angeles, was certainly auspicious. Capital and population were pouring in; new and gigantic enterprises were inaugurated every day; real estate values were increasing at fabulous rates; everything indicated a season of wonderful prosperity. The city was in a good sanitary condition, and as a health resort, especially, was becoming very popular, as was attested by the thousands of invalids who were making their homes in Los Angeles. The appearance of any epidemic disease interfering with this unprecedented prosperity would naturally be very unwelcome. So it is easy to picture the horror of our citizens when it became known that smallpox was in our midst.

The first cases reported to the Health Officer, Dr. J. S. Baker, were on February 16, 1887; J. B., 47 Vine Street, and F. W., 200 Main Street, near Third. Next day, four more cases were reported—Pedro L., corner Main and Seventh; Joe L., Seventh and Spring; F. C., 28 South Spring; and McN., at South Pasadena. Three others were added on the eighteenth—A. H., corner Castelar and Bellevue Avenue; W. P., St. Vincent's Hospital; and J. H., Missouri House, near Southern Pacific depot; and on the nineteenth, still another, José O., 238 Upper Main Street, making, in all, ten cases by the evening of the nineteenth, all of whom were immediately removed to the smallpox hospital, or carefully isolated at their homes. All of these first cases were young men, which fact, taken in connection with their being almost simultaneously affected, would indicate a common source of infection. Investigation since has served to well establish this theory, for it was proved that all these young men were in the habit of frequenting a certain variety theater in this city, where it is supposed that the infection was introduced by the clothing of some visiting Mexicans, smallpox being known to exist in Mexico at that time.

Of the ten cases, the one at South Pasadena died February twentieth, and four more on the twenty-second. As a natural sequence, the city, crowded at the time with thousands of health and pleasure seekers from the East and elsewhere, was on the verge of a panic.

Reports now began to come in of cases in other localities. At the Lugo settlement, nine miles from Los Angeles, three miles this side of Downey Post Office, three cases were reported on the twenty-seventh, one of variola, the others varioloid. These cases were easily traced to the corner of Seventh and Main streets, Los Angeles, whence Pedro L. had been removed to the smallpox hospital.

On the same day, February twenty-seventh, Dr. T. E. Ellis, of Elsinore, San Diego County, telegraphed to me that he had heard of a death from smallpox on the San Jacinto Plains, some twelve miles distant from Elsinore. A few days later Dr. Ellis reported by telegram the cases of two brothers, one only of whom had been vaccinated; the other afterwards died. All these parties had recently visited Los Angeles.

On the tenth of March a little nine-year old daughter of Mr. Andrew

Hay, a resident of the northern part of Los Angeles City, was taken, and died on the fourteenth. Mr. Hay immediately removed with the rest of his family to his ranch in Cahuenga School District, about ten miles from Los Angeles. But the rest of his children, three in number, were smitten with the disease almost simultaneously, and died respectively on the twenty-first, twenty-third, and twenty-seventh of the month. It was at first claimed by the family and their attendants, that these children had measles, and not smallpox, but that, notwithstanding, they were vaccinated and revaccinated, with resultant septicæmia and death. But from all the evidence obtainable, they were undoubtedly genuine cases of smallpox.

At Ravenna, fifty miles north of Los Angeles, on the line of the Southern Pacific Railroad, a case was reported to me, March seventh, through the County Board of Supervisors. I immediately notified Dr. J. S. Turner, of San Fernando, the Health Officer of that district, to investigate. That gentleman reported the case as doubtful, but prudently isolated it. It proved afterwards to be only measles. On the ninth, another case was reported. Dr. Turner at once visited the locality, and found a miner by the name of Beckwith, aged thirty-five, with symptoms of varioloid. Every precaution was taken to isolate the man, and the whole neighborhood was carefully vaccinated. The case developed slowly, and was very obscure from the beginning to the end, but the efficient precautions prevented any cases resulting therefrom. After this patient was discharged, an eruption appeared on his face, and attracted attention on the train as he was leaving the county, and it was thought best to detain him at the hospital for suspects in Los Angeles.

At Port Ballona, Dan. Mahoney, a laborer on the wharf, aged thirty-five, after a spree in Los Angeles, returned to his work, and soon after (March twenty-seventh) developed a virulent case of variola, which caused his death April second.

At Green Meadows, about ten miles southwest of Los Angeles, four cases were reported to me during the month of March, in the McLane family—released April nineteenth.

At the Vernon District, near the eastern city limits, seven cases were reported on the ranch of Diego Lopez, a native Californian. These cases were scattered along through March and April, and the last were discharged May fourteenth.

Santa Monica had one case, reported March fifteenth, by Dr. E. C. Folsom; a child with varioloid.

South Pasadena, in all, reported eight cases, with one death; the first.

At Alhambra, close to South Pasadena, nine cases were reported in the Wallace family; three of variola, the others varioloid.

At Ontario, San Bernardino County, about thirty-five miles from Los Angeles, and on the line of the Southern Pacific Railroad, Dr. Elwood Chaffey reported a case of variola and one of varioloid March fifteenth; and another, April twenty-sixth, at Cucamonga, near Ontario. These cases also were easily traced to Los Angeles.

From San Buenaventura, Dr. R. E. Curran telegraphed March fourteenth the report of one case, "imported from Los Angeles."

At San Diego, Dr. Magee, Health Officer, reports to date, June first, a total of twelve cases, with two deaths. One of these was a little native California boy, aged twelve, named Pedro Garcia, who, with his little sister, aged eight, had been sent from Los Angeles to the Mission School in Old San Diego, hoping to avoid the disease which had already afflicted one member of the family living in another part of the city, but they were both taken sick and admitted to the smallpox hospital March twenty-third. At this writing, June third, Dr. D. B. Northrup, the present Health Officer, reports that the disease has disappeared from the county, but that he has heard of a few cases at Ensenada, on the peninsula of Lower California.

In this city, up to date, June first, we have had in all one hundred and twenty cases, fifteen of which proved fatal. In the county, outside the city, fifty-six cases were reported, with six deaths. In other counties, twenty cases and four deaths; thus making a total of one hundred and ninety-six cases, with twenty-five deaths.

The mortality, about 12½ per cent, is much less than we usually observe in epidemics of other diseases. A noticeable fact is the general absence of the usual disfiguration, very few cases showing any trace of the disease. From these facts we naturally infer first, a mild form of the disease; second, efficient and faithful treatment by those in charge.

The simultaneous appearance of seven or eight cases of smallpox, some of them being actually picked up on the streets, supplemented by the death of four of them on the same day, was necessarily startling. Exaggerated statements flew from corner to corner, and rumor soon located cases at the various hotels. Wherever a doctor was seen to enter, the inference was, "another case of smallpox." The papers of San Francisco and other places took up the cry, and Los Angeles was declared to be overrun with the plague, before, in reality, a dozen cases existed. Our city was crowded with strangers, and, of course, more or less excitement ensued; and it is estimated that at least ten thousand left the city in one week. On the other hand, there was a disposition on the part of our city press to err as badly in the other extreme. Our daily papers asserted editorially that only a very few sporadic cases existed, that these were very mild, that the disease was under perfect control, that there was no possibility of an epidemic, and no necessity for alarm.

Some of our leading physicians, and others, seemed to recognize the danger at once, and by communications to the press, and to those in authority, did all in their power, not to unnecessarily alarm the public, but to arouse it, before it should be too late, to some organized system of resistance. These worthy efforts were belittled, and the projectors ridiculed. Instead of coöperating, and doing all in their power to throttle the disease in its first visitations, these would-be sanitarians scoffed and sneered. Nothing should interfere with our boom—travel should be unimpeded, passengers should be allowed to circulate with perfect freedom, and the bare thought of a possible quarantine caused a perfect howl of indignation. The result of this was to make people comparatively careless. 'Tis true, that at first the number of cases was comparatively small, and, in fact, in the city never exceeded twenty at any one time. But with prompt and concerted action in the beginning, the disease could have been stamped out at once, and many lives and much expense would have been saved. As it was, a great many of our citizens, influenced by the statements of our city press, underestimated the necessity for stringent measures, opposed and thwarted those who tried to prevent the spread of the disease, and thus, directly and indirectly, were the cause of its being as serious as it was. Cases were actually kept carefully concealed by their friends, because they did not believe in vaccination, and did not wish to submit to the inconveniences of isolation, or the smallpox hospital. Thus the contagion was allowed to spread to others, and many cases are traceable to just such exposure.

In several instances well authenticated cases were under the care of irregulars and quacks, who, from ignorance, or, perhaps, selfish motives, failed to recognize the nature of the disease, and carelessly permitted its dissemination. In a few instances, chiefly in the beginning, cases of varioloid were mistaken for measles and chickenpox, and unnecessary exposures multiplied the foci of contagion. On the other hand, one or two cases of measles and chickenpox, in the excitement of the hour, were mistaken for smallpox, and the unfortunates isolated from friends and relatives, till the error in diagnosis was established. One of our county officials was a notable case in point. One woman, having been treated three years previous for supposed variola, came down from San Francisco, and was permitted to enter the smallpox hospital to nurse her father. She soon developed the disease, and came near dying. I think, in all, fifteen cases or more were carefully concealed from the Health Officer, and not discovered till, in some instances, death or convalescence had taken place.

Dr. W. A. Brown, of Downey Post Office, mentions meeting a tramp who had smallpox unmistakably, but who escaped into the willows before he could be secured, and although he was seen by others afterwards, he was never "corralled." No doubt there were other similar cases.

The last case near Downey is said to have been caused by infected clothing, which a discharged patient from the Los Angeles Hospital had smuggled away with him, although it was supposed that they had been destroyed according to orders. It is also said that the hack used in transporting some of the original cases was, by neglecting disinfection, the instrument of spreading the disease to several later cases.

These cases are cited as instances where, either through neglect or oversight, the employment of proper preventive measures were omitted, and the disease thus permitted to spread.

As soon as it was known that there were cases of smallpox in Los Angeles City, I addressed a *private* circular letter to a number of well known and reliable physicians throughout Southern California and Arizona, notifying them of the existence of the disease, and asking their assistance in discovering its origin, and in limiting its further ravages. I also addressed a communication to the County Board of Supervisors, calling their attention to the necessity of prompt and active measures, and asking that competent persons be appointed as Health Officers in each town or township, whose duty should be to investigate all reported cases, and, as far as possible, prevent any further dissemination of the disease. I give this communication in full:

To the honorable Board of Supervisors, Los Angeles County:

GENTLEMEN: As a member of the State Board of Health, and as an old citizen and taxpayer, I deem it my duty, in a few words, to call your Board's attention to the presence of smallpox in our city and county, and to inform you that the disease threatens to prove epidemic if it is not speedily "stamped out," either by general vaccination or strict quarantine.

That it must be stamped out no one will deny; when or how soon I wish some one could tell.

So far it has made its appearance (imported from Mexico) in two localities outside of Los Angeles—South Pasadena, and at the Lugo settlement nine miles from the city. A case of varioloid was reported near Anaheim, which puzzled two physicians, and which was very properly promptly quarantined; but, fortunately, it proved to be a severe case of varicella, closely resembling varioloid, and the quarantine was raised.

As soon as the first cases of smallpox in the county were reported, Supervisors Rowan and Macey, acting for the Board, under the law, employed a competent physician at Pasadena to act as Health Officer—to enforce strict quarantine, and to purchase vaccine virus, and to enforce vaccination. Fortunately, owing to the prompt measures and action then taken by your Board, no other cases have been reported from South Pasadena, outside of the family originally infected. The whole district has been, and is now, under close and strict inspection, and it is to be hoped that we will not hear of any more cases in that locality, unless it should make its appearance at San Gabriel among the native Californians, who refuse vaccination.

At Lugo's the disease was carried from this city, from the corner of Seventh and Main streets. At that settlement we have five cases *reported to date*—one of smallpox proper, the others varioloid.

Dr. J. Turner, of Los Angeles, by order, first went out to inspect these cases, then only three, on Sunday, February twenty-seventh, and again on the twenty-eighth. He quarantined them and put up a yellow flag, etc; offered and tried to vaccinate all exposed, *but was refused.* Dr. W. A. Brown, of Downey City, has since, by order of Supervisor Venable, been acting as Health Officer in that section, and has, and is now doing, I understand, good work.

This loathsome disease must be arrested, and as quickly as possible, and can only be stamped out by general vaccination, and by prompt and vigorous action on the part of your honorable Board and the city health authorities. So far, some good and satisfactory work has been done, but I am sorry to inform you that the disease, after a lull for about a week, is again on the increase in the city, and it is to be feared will be carried out into the several towns and districts throughout the county.

Such, gentlemen, are the facts. The State Board of Health, apprehending the invasion of the disease, endeavored two years ago to get an appropriation from the Legislature "for a contingent epidemic fund," to be used to prevent the introduction of contagious and infectious diseases into the State, especially this southern section, exposed, as we are, both by rail and sea, on account of our proximity to Mexico. All efforts failed, and again this season an effort was made, and only a few days ago have we succeeded at last in getting one half the appropriation asked for; but it is too late this season to establish quarantine on the line of the Southern Pacific Railroad; the disease is already in our midst. But as sanitarians and Health Officers of the State, I can assure you on behalf of our State Board of Health, that we will do our utmost to assist your Board of Supervisors in stamping out the pest, and would suggest that whatever action your Board may now take, should be prompt and effectual, no half-way measures; competent Health Officers and Health Boards, with full power to act, should be appointed in every town and district in the county. General vaccination and quarantine should be enforced, and then by diligent, continuous watchfulness and care, it is to be hoped that in a reasonable length of time your Health Officers will be able to report a clean bill of health for the whole county.

Perhaps it is needless to say to you that I am in close daily communication, both by mail and by wire, with all parts of our county, as well as the whole State; and as said before, it is only by united, continuous, proper, and prompt action can we hope to soon get rid of this threatened epidemic of smallpox.

All of which is respectfully submitted by—

H. S. ORME, M.D.,
For State Board of Health.

On receipt of this report, the Board immediately requested me to assist in appointing such men as were competent, and a corps of active and intelligent physicians was at once selected, with instructions to ferret out every case, and to provide for its complete isolation and proper treatment. Efficient agents were employed to keep watch, and report all suspects, so that within fifteen minutes after the discovery of a case a competent physician would be in charge. Thus everything possible was done both to carefully attend to patients, and to prevent further spread of the disease. Printed instructions to physicians, with reference to vaccination, treatment, disinfection, etc., and the same to the public, informing them on sanitary matters, were distributed freely among the people. Every effort was made to stamp out the disease at once.

The matter becoming still more serious, as President of the State Board of Health I felt it my duty to call a meeting of the State Board at Los Angeles, to consider the advisability of still more active measures; and Dr. Tyrrell, the Secretary of the Board, with Drs. Cole, Simpson, and Crowder, comprising a majority of the Board, arrived in the city March thirteenth. On the fourteenth, by request of Mayor Workman, a conference was held with the city authorities, and the proper management of the disease, which was rapidly becoming epidemic, was discussed and agreed upon; and at the request of the Mayor, a public meeting was called for the purpose of apprising the people of the danger of the situation, and arriving at some definite plan of action. Universal vaccination from house to house, and the complete isolation of every case as soon as discovered, with thorough disinfection, was recommended. It was also decided to consult the railroad authorities, who readily promised and *gave* their active coöperation in detaining and fumigating infected trains, vaccinating employés, etc.

It was also decided to appoint Medical Inspectors along the lines of travel entering California, whose duty it should be to inspect all trains and vessels, and detain every case of a suspicious nature, vaccinate all passengers exposed, etc.

The State Board then made an official visit to San Diego on the fifteenth, and found they had had one fatal case of smallpox, contracted at El Paso—a lady tourist. Her husband was afterwards taken, and detained at the smallpox hospital. Returning, they visited San Bernardino, interviewing Mr. J. N. Victor, Superintendent of the California Southern Railroad. Thence they went to San Pedro, and back to Los Angeles. Each of these points was carefully inspected, and the railroad, and other authorities, impressed with the importance of active coöperation, which they promised and gave. The following physicians were appointed by the Board as Inspectors: Dr. Thomas L. Magee, at San Diego; Dr. W. A. Weldon, at San Pedro; Drs. J. J. Choate and C. P. Brierly, at Colton; Dr. Q. J. Rowley, at Mojave; Dr. H. J. Bordè, at Tulare City, with Dr. M. F. Price as consultant at Colton. Printed instructions as follows were given these gentlemen by the State Board, and faithfully carried out:

STATE BOARD OF HEALTH.

Instructions to Medical Inspectors for the State Board of Health.

—— ——, *M.D.:*

Dear Sir: You are hereby appointed Medical Inspector for the State Board of Health for the district between —— ——, and the following general rules are published for your guidance:

You will take a convenient position at your assigned station and inspect the emigrant cars on their arrival, at the same time making inquiries of the passengers as to the existence of any sickness on board at the time, or as to there having been any eruptive form of disease among them since leaving —— ——. In this investigation valuable information may be obtained from the conductor and other employés of the train.

Should any case of smallpox be discovered upon any car, you will direct said car to be quarantined, or side-tracked, at a point suited to the well being and comfort of the sick, and at the same time adapted to the convenience of the railroad company. It is desired that the work to be done should so be ordered and conducted as to subject the company to the minimum of inconvenience consistent with its energetic and efficient discharge in the interest of public health.

The other passengers on infected cars should be transferred to another car, but not mixed with passengers on uninfected cars. You will examine them carefully to ascertain whether there are any unvaccinated persons among them. All such should be immediately vaccinated, making at least two points of insertion. You will also vaccinate all upon the infected car, and detain them for a period of twelve days from the date of their exposure to the disease.

You will also inspect the express trains, and satisfy yourself that no cases of smallpox were on board. In this examination the conductor and other employés of the cars will be of essential service to you. Should you be satisfied of the presence of smallpox, you will adopt the means just recommended for emigrant cars.

If, upon inquiry, you find that any passenger upon a car has been sick with smallpox during the trip, and has died or been removed from the car, you will consider such car to be infected, and proceed therewith in the manner directed for cars upon which smallpox has actually been discovered.

When any car containing smallpox has been quarantined, you will aid the railroad authorities in seeing that the passengers thereon are well and comfortably cared for, and that the car, after the recovery or removal of the sick, is thoroughly disinfected, according to the rules laid down in the general instructions for disinfection issued by the State Board of Health.

You will be expected to keep a record of cars quarantined, cases of smallpox discovered, and vaccinations and revaccinations performed, and of every other proceeding under the duties assigned you, and to report the same in writing to the Secretary of the State Board of Health at Sacramento at least every third day.

The duties to which you are assigned are important, yet delicate, and the State Board of Health trusts to your discretion and good judgment so that they be exercised with prudence, and with an endeavor to disarm opposition by a courteous and dignified appeal to reason, and the demonstration of the necessity of the measures adopted, rather than by the exhibition of arbitrary authority.

By order of the State Board of Health.

G. G. TYRRELL, M.D.,
Secretary State Board of Health, Sacramento.

Previous to this, arrangements had been made by the city authorities with the Sisters of Charity by which they agreed to assume entire charge of the smallpox hospital, furnishing provisions, cooks, medicines, and everything required, except bedding, fuel, and such male assistants as were necessary; these to be furnished by the city, the Sisters to receive $3 per day per patient. A similar arrangement had been made with the Sisters during a previous epidemic in 1868, also in 1873. The smallpox hospital was not a popular suburb, and many efforts were made to have it removed to another locality, the residents in the vicinity claiming that several cases occurred in that neighborhood through the proximity of the pesthouse. The difficulty of securing another site for so objectionable an institution, however, caused the removal to be abandoned, and the hospital remains in the same place.

EXPENSES.

The direct expenses to the city and county of this campaign against smallpox, extending over nearly four months of time and a great expanse of territory, were necessarily great. Eighteen thousand dollars is the estimated cost to the city, $12,000 additional to the county; and indirectly many thousands more must be added to our losses. Physicians were employed at $10 per day. Nurses exacted very high wages. In fact, nothing could be done in connection with the disease that did not cost a fabulous price. Many cases proved spurious, but the expense of investigation was of course the same. Then the care of cases in families extending over months, at distant points, involved the expenditure frequently of many hundreds of dollars. It was made manifest to our city and county authorities that everybody expected to be well paid for handling smallpox.

In the Ballona case, particularly, there was great demoralization. Nurses were engaged who failed to report, and others employed spent their time in carousing to the utter neglect of their charge, and then demanded $10 per day for their services.

LESSONS OF THE EPIDEMIC.

There are two important lessons to be learned from our late epidemic. First, that isolation and quarantine, though highly important, are not sufficient in themselves to stamp out the disease; they must be supplemented by vaccination. Second, that vaccination, as it is often performed, is no protection whatever. Thorough vaccination and revaccination is an almost absolute preventive.

Absolute and perfect isolation is generally very difficult. In a crowded city it is well nigh impossible. In an open country it can sometimes be accomplished; but even here the most stringent measures fail to make the quarantine absolute, generally through want of sympathy and coöperation on the part of the family; sometimes in spite of these. As an instance, may be cited the case of Mr. Andrew Hay's hired man, who developed smallpox some time after the death of Mr. Hay's children. The man was very careful not to enter the house at all, and it is supposed he contracted the contagion by fondling a pet dog that had been allowed access to the children.

While in most cases the people recognized the importance of the preventive means adopted by the physicians, instances were too frequent in which violent opposition was encountered by Health Officers, and every effort to vaccinate, fumigate, or isolate was met with open defiance. In one family in particular, a case of variola occurred, and when physicians were sent to vaccinate the rest of the family, and to disinfect the house, they were violently resisted, and in two weeks others of the family contracted the disease, just through their refusal to take proper precaution.

It is a significant fact, that when cases were promptly reported and taken to the hospital there was no further contagion from that source. But when the cases were allowed to remain at home, it frequently spread to others.

It is a well established fact that vaccination is a preventive of smallpox. Yet there still lingers among many of the native Californians and ignorant classes a prejudice against it. Especially do they object, like the French population of Montreal, to be vaccinated during the prevalence of an epidemic. And even among those who should show more intelligence and better information, we find, now and then, the most bitter hostility to this simple procedure. One of our worst cases was a young man from Massachusetts, whose State laws require every child to be vaccinated before he can enter the public schools. Through prejudice in his family he had never been vaccinated. The folly of their course was probably fully apparent to him before he recovered.

Another instance, in a family who came three years previous from Canada. The mother favored vaccination—the father objected; but on the appearance of the disease in Los Angeles, the children were sent to me to be vaccinated, one of them being quite unwell at the time. Two days later I was called to their house and found the little girl who had been complaining sick with genuine variola. I immediately revaccinated the mother. There was but the one case in the family, which ought surely to convince the father of the utility and necessity of vaccination. This last case, I think, I have traced to their school, where children were in attendance from families in which were concealed cases of smallpox at the time.

With everybody vaccinated, there would be no smallpox, and there should be a law making vaccination compulsory. The medical societies everywhere, voicing the expressions of their individual members, heartily and unanimously favor it. In many States, and in San Francisco and Sacramento, the public schools are open only to those who have been vaccinated, which is a move in the right direction.

Vaccinations frequently fail. In Los Angeles, of thirty thousand vaccinations, at least one third had to be repeated. To this fact much of the prejudice against it may be justly attributed. Cases of smallpox occurring in those who have been vaccinated are often cited by the opponents of the system. These cases are always those in whom the vaccination has been imperfect, or in whom the protection period has lapsed. The act has been performed, but with negative results. The virus, through age, or something else, has no power, and does not "take." Or, in some cases, it takes, but after some years the individual loses his immunity, and should be revaccinated, but is not. Still, because he contracts the disease, he claims that the whole theory of vaccination is wrong, and raises his voice against it.

The experience of the world has proven, unmistakably, that vaccination, properly performed, with good virus, and repeated every seven or eight years, is an absolute protection.

Failures are, unfortunately, too numerous, but should make us only the more careful. We should keep a primary vaccination in sight until we *know* that the work is good. In our late epidemic, the number of revaccinations was very large. The points furnished in some instances seemed absolutely worthless. Why, does not appear. It may be that in transit the points became defective, or possibly were not properly dipped. The points are always carefully packed, and protected from atmospheric influences. Still the fact remains that but few of them were effective.

The advantages to us of a vaccine farm on this coast would be great. Then we could be sure of obtaining fresh material. About a year ago an effort was made to establish a vaccine farm in Southern California, by a very competent man, but he died while making the necessary arrangements, and nothing further has been done. But we understand that the subject is again being agitated, and hope for a practical result.

Our last cases were all among those who refused vaccination. In more than one instance physicians were sent to vaccinate families who resisted, and afterwards suffered for their ignorant prejudice.

Our people need enlightenment in regard to sanitary matters. Much has been done already, but much remains to be done. When thorough vaccination and revaccination are systematically and regularly performed, there will be no material left for this dreadful scourge. Until then we will be subject, every few years, to visitations of this easily avoided pest.

In concluding, it may not be out of place to notice the hostility shown by the press of our city on the occasion of the visit of our State Board of Health. Even the individual members of the Board were attacked in the most shameful manner, and all sorts of improper motives assigned as actuating them in the performance of their duty. They were accused of a desire to quarantine the city through jealousy. Because of our wonderful prosperity these gentlemen were supposed to be enviously trying to injure us. Even though it was apparently forgotten that the members of the Board were honorable gentlemen, it ought to have been remembered that they were officers, sworn to the proper performance of their duty, and that, in the general welfare, they could not be supposed to discriminate in favor of any particular section to the detriment of the whole. It should not be forgotten that the President of the Board was himself an old citizen of the city, and as much alive to its welfare as any editor of any paper in Los Angeles. The members of the State Board worked faithfully for the interests of the whole State, and gave an amount of time and personal attention to the matter for which they will never be adequately recompensed.

TABLE OF CASES.

LOCALITY.	Number Cases.	Number Deaths.
Ballona	1	1
Cahuenga	4	4
Downey	21	None.
Alhambra	9	None.
South Pasadena	8	1
Green Meadows	4	None.
Vernon District	7	None.
Ravenna	1	None.
Santa Monica	1	None.
Total of county, exclusive of city	56	6
Los Angeles City	120	15
San Diego City	12	2
Elsinore	3	2
Ontario	3	None.
San Buenaventura	2	None.
	20	4
Grand total	196	25

SUPPLEMENTAL REPORT.

By H. S. Orme, M.D., President.

The following correspondence occurred in regard to the interests of Southern California as to the smallpox:

Board of Trade, Los Angeles, Cal.,
December 31, 1887.

T. E. Rowan, *Esq., Chairman Board of Supervisors, Los Angeles County:*

Dear Sir: For several weeks past the attention of our people has been called to the dispatches appearing in our papers relative to the rapid spread of smallpox in San Francisco. On the twenty-ninth instant, at a meeting of the Board of Health of that city, the Board passed a resolution declaring the smallpox epidemic, and stringent measures were ordered to fight the disease.

Self preservation is the first law of nature, and the rule applies as well to communities as to individuals. I am directed, therefore, on the part of the Directors of this Board, through its President, Mr. Eugene Germain, to call your attention, and that of your honorable Board, to the existing state of affairs in that city, and to suggest that it would be eminently proper, on the part of the Board of Supervisors, to take immediate action to prevent, as far as practicable, the advent of that dread disease into our city; at least so far as it can be prevented from reaching us from San Francisco over the ordinary routes of travel, viz.: via railroad and steamer.

Quarantine officers stationed at San Pedro and at Tulare, on the Southern Pacific, acting under your authority, would, in our opinion, be the least precaution that our community could take.

I am directed further to suggest that you call a special meeting of your Board, to take immediate action.

Very respectfully yours,

A. M. LAWRENCE, Secretary.

Los Angeles, California,
December 31, 1887.

T. E. Rowan, *Esq., Chairman Board of Supervisors, Los Angeles County:*

Dear Sir: Your request, made to me at your special meeting held this day, to answer the letter of the Los Angeles Board of Trade of even date, is at hand.

They suggest that the Board of Supervisors take such measures as will prevent the appearance of smallpox in our midst, and in their letter they state: "Quarantine officers stationed at San Pedro and at Tulare on the line of the Southern Pacific, acting under your authority, would in our (their) opinion be the least precaution that our community could take."

Would say in reply, first, that your Board ought to appoint a competent Health Officer both at San Pedro and Newhall, and in fact in every unincorporated town and also township in the county. Tulare is not in this county, hence I mention Newhall.

The State Board of Health will in the future, as in the past, exert itself to the utmost to assist the proper authorities in each and every section of the State to "stamp out" the smallpox and every other contagious and infectious disease which may threaten the people.

From the active and earnest coöperation the State Board of Health received from your Board of Supervisors early in the year, we have no doubt that you can assure the Los Angeles Board of Trade and the citizens of Los Angeles County, that everything possible will be done to speedily eradicate the disease upon its first appearance in this section.

In conclusion, I would state that I have just telegraphed Dr. Tyrrell, Permanent Secretary of the State Board of Health, to call a meeting of the Board at once, when the whole subject-matter of protecting the State from a threatened epidemic of smallpox will receive most careful consideration, and the most effective measures will be speedily adopted.

All of which is respectfully submitted by—

H. S. ORME, M.D.,
President of State Board of Health.

The next case of smallpox reported in Los Angeles was on the eighth day of December, 1887, being a Chinaman, Ah Sin, lately arrived from San Francisco, where the disease was prevalent. He had been sick about eight or ten days in Chinatown when discovered. He was immediately removed to the smallpox hospital, and the surroundings thoroughly disinfected. This case was soon followed by a negro, Tom Worthan, who had lived near the Chinaman, and from that time until the present (July, 1888) cases have been reported at intervals all over the city.

When the Chinaman was discovered, December 8, 1887, Dr. Hagan was Health Officer, which position he continued to hold until February 16, 1888. Doctors Thompson and Cole were his assistants. After this date Dr. J. W. Reese took charge as City Health Officer. During the incumbency of Dr. Hagan, the State Board of Health was promptly informed upon the appearance and location of every case of smallpox, and the coöperation of the Board sought and cheerfully given in "stamping out" the disease. A tent for free vaccination was erected on the City Hall lot, on Fort Street, where over three thousand persons were vaccinated. As soon as a case of smallpox was reported, it was immediately visited, and if the diagnosis was confirmed, the patient was at once removed to the smallpox hospital. The house where it was found was thoroughly disinfected, and all the inhabitants of the locality vaccinated. Owing to these precautions it is said that during the administration of Dr. Hagan, with the exception of the Chinaman and negro above mentioned, there were no two cases of the disease from the same neighborhood.

The whole number of cases reported by Dr. Hagan to the State Board of Health from December 8, 1887, to February 16, 1888, was twelve, with one case on hand in the hospital, and three convalescent, the day his successor (Dr. J. W. Reese) assumed charge.

About this time, the ground being needed for building purposes, the vaccinating tent was removed, and in various ways an attempt was made to create the impression that the disease had disappeared from our midst. The State Board of Health, whose duty it is to keep informed on such matters, through its President and its Secretary, several times kindly requested of the Health Officer of Los Angeles for information as to the exact number of cases and their location, being willing and anxious to coöperate in suppressing the disease. However, no exact official information has been furnished the State Board of Health, but I was verbally informed about the eleventh of June by the Health Officer, that he had reported to the City Board of Health one hundred and ten cases up to that date. Cases have occurred since. The last case is said to have been discharged from the smallpox hospital on August 22, 1888. To the misfortune of our city, it is easier to suppress information concerning the disease than to exterminate the disease itself.

During the late epidemic very great need was felt for a suitable smallpox hospital, which, indeed, should have been built more than a year ago. Ten or fifteen years since, the present hospital was built just at the close of an epidemic, and thus, to our shame, blunders multiply.

It is undoubtedly a great mistake to erect expensive buildings for this purpose, in which patients are crowded, with many in a ward filling the air with germs of disease and causing to a great extent the terrible sequelæ of blood poisoning that so often follows variola, and causes many deaths. The pavilion plan, or a group of isolated cottages, is the best, as it is airy, disconnected, and affords much better ventilation than the ordinary style of building. At a safe distance there should be a house of detention where doubtful cases could be kept until the diagnosis became certain. During the last season several cases of measles and other exanthemata were mistaken for smallpox, one of which was sent to the pesthouse, where he contracted the genuine disease. A house of detention would have prevented such an unfortunate occurrence.

There should be an ambulance attached to the hospital, and under no circumstances should a patient be removed in a private or public conveyance. During the past season at least two cases, one of which ended in death, could, with considerable certainty, be traced to negligence in this respect.

Houses and localities that have been infected in the past should be watched with suspicion; and when it is known that a house is infected, the proper way is to quarantine it with all its inmates, and not, as was the case this year, to close the house against its occupants, thus sending them throughout the city—so many fresh foci of contagion.

The City Health Officer should be obliged to forego private practice and devote all his time to his official duties; and especially ought this to be the case during the prevalence of any epidemic *contagious* disease. *Vaccination*, *isolation*, and *disinfection* should be our watchwords; with these *thoroughly enforced* we can bid defiance to smallpox.

The following is a brief resumé of the cases of smallpox which occurred in Southern California during the past season:

Los Angeles City (estimated)	115 to 125 cases.
San Fernando	3 cases.
Whittier	8 cases.
Duarte	2 cases.
La Ballona	2 cases.
Alhambra	1 case.
San Pedro	1 case.
Pomona	1 case.
Santa Barbara	1 case.
San Bernardino	3 cases.
Riverside (2 deaths)	8 cases.
Ontario	1 case.
San Diego City	7 cases.
Moosa Cañon (3 deaths)	6 cases.

The number of cases, it will be seen, was at least one hundred and sixty-five, of which number about one hundred and twenty-five occurred in the city of Los Angeles; and of the cases occurring in the surrounding country, the infection of the greater number can be traced directly to Los Angeles.

For example, the eight cases at Whittier originated from two cases which were both traced to this city. These cases were under the efficient care of Dr. Q. J. Rowley, of Downey City; and there would no doubt have been fewer cases if the citizens of Whittier had not acted so peculiarly, in persisting for several days that the disease was not smallpox, although experienced physicians had twice confirmed the diagnosis.

At La Ballona the first case reported was on May thirtieth, a native Californian, aged thirty-five, who had contracted the smallpox while on a visit to Los Angeles. Eighteen days afterwards his child, whom they refused to have vaccinated, contracted the disease. These cases were carefully looked after, and no others resulted therefrom. On June nineteenth Maggie Ybarra, aged about thirteen, living at No. 142 Yale street, Los Angeles, was taken to La Ballona, feeling slightly unwell; three days afterwards (June twenty-second) she was brought back to the city and put in the smallpox hospital. Her little brother, aged about nine years, had been left with relatives at No. 442 New High Street, was taken with the disease on June twenty-fifth, and reported to the Health Officer June twenty-eighth, showing the same origin for the two cases.

EXPENSES.

During the former epidemic (1887), there were one hundred and twenty cases of smallpox, which, as has been shown, cost the city $18,000; and as there were probably about one hundred and twenty-five cases this year (rumor says more), it is presumed that the expense to the city will be nearly as great. We allude to this item always of interest to the citizen and taxpayer, to show that any epidemic disease is a very expensive luxury, and to still further prove the old, true, trite saying that "Prevention is better than cure."

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With his consent, I append the able report of Dr. L. S. Thompson, who had charge of the smallpox hospital (being resident physician) during the last season, and will call particular attention to the cases cited showing the great protective power of vaccination. It is plain to all progressive practitioners that "preventive medicine" will be the medicine of the future, and we who have had the longest and most extensive experience, know that simply because a man is an M.D. he need not necessarily be a sanitarian. Also, we take pleasure in submitting the report of Dr. West Hughes, who, at my request, acted for the Board of Supervisors of Los Angeles County, as Health Officer at San Fernando, and who held the disease in check by his thoughtful and prompt action in the matters of vaccination, isolation, and disinfection.

To the Mayor and members of the Board of Health:

Gentlemen: I beg leave to submit to you as briefly as possible this report covering the period of my incumbency as physician in charge of the smallpox hospital. From the beginning until the end of my duties I had under treatment eighty-nine patients, five of whom died, being a fatality of about one in eighteen, or a little less than 6 per cent; making, so far as I can learn, the best record in this country. The result in smallpox hospitals, so far as my knowledge goes—and according to the best authorities—ranges from 15 to 50 per cent. Of the eighty-nine cases, fifty-one (or about 60 per cent) had never been vaccinated; twenty-one had been vaccinated more than twenty years previously; eight more than ten years ago; and one, a German, claimed to have been successfully vaccinated but three months previously—but as he was at the time suffering from oak poison, it is probable that the sore following the abrasion was not vaccinia. Eight were vaccinated after having contracted the disease. So that of the whole number admitted *not one* was, according to the best medical authorities, thoroughly protected; or in other words, there was not a patient stricken by this dread disease that had been vaccinated within the time during which vaccination is believed to thoroughly protect (seven years), and not a death occurred among those that had *ever* been vaccinated even though more than twenty years had elapsed. Two of the five deaths were of the hemorrhagic type of the disease, which is almost necessarily fatal; the remaining three were of the confluent type, which is ever very serious. Sixty were males, and twenty-nine were females. Twenty were under twelve years of age, thirteen between twelve and twenty, and the remaining fifty-six ranged between twenty and forty-six. All of the patients, with the exception of two, were newcomers to our city—having resided here less than a year—which fact speaks in no uncertain manner in favor of the very thorough system of vaccination inaugurated by Dr. Hagan last year and continued during his occupation of the health office.

I feel the importance of bearing with considerable weight upon this subject of protection by vaccination, as seen in fact when this most loathsome malady is met and studied. Theorists are ever ready to rush into print with argument for or against its protective influence, though but few of them have ever studied it at the bedside, and learned by actual contact the true story, as told by nature. Facts are indisputable, and far more convincing than theories, so I beg leave to cite some that have come to my notice during the past winter; I do so with the more emphasis, for I know that at least two of the deaths were attributable to articles published against the practice early in the season. A Mrs. Mann and a Mrs. Nevils, residing on New High Street, refused to be vaccinated, though all the other residents of the locality (including the little son of Mrs. Mann, and numbering in all thirty) were protected by it. On the twenty-second of February, Mrs. Mann was admitted, and on the twentieth of March Mrs. Nevils became a patient; both were dangerously sick, and only saved by the utmost care and attention, and will be much marked for life; while of all the thirty who were just as much exposed *not one* contracted the disease. The little boy of Mrs. Mann, though he came to the hospital and was continually exposed by mixing with the other patients, escaped without even the slightest attack.

A young man named Heckman was quite intimate with a family by the name of Augustine, when a boy of the family was attacked, though not discovered by the health department until well advanced, having been treated for measles. All the members of the family were at once vaccinated, but Heckman, fearing serious results, secreted himself, and in a few days was taken down with confluent smallpox, and died on the tenth day; while two boys, a girl, and the mother, though contracting the disease, were so protected by the vaccination that all passed through without at any time being dangerously sick; had the protection been received one week sooner, they would probably have escaped entirely.

A little girl named Griniger was admitted March fifteenth, suffering from confluent smallpox. Her three brothers and a sister were immediately vaccinated, but as the disease had (as was afterwards proved) even then made its attack, they were not entirely protected, but though some of them had very grave symptoms at the beginning, the protective influence soon made itself known, and so modified the disease that they all made a rapid and good recovery, while the *unvaccinated* one recovered after a long and painful sickness.

Ada Mills, aged seven, and Tommy Cates, aged three, were vaccinated within a few days of the outbreak, and I do not hesitate to say that they owe the fact that they still live to the fact that they were protected.

It is true that about seventy-five per cent of unvaccinated children die when attacked by variola, while out of eleven received this winter two only died, and *neither of these had ever been vaccinated.* Three of the nurses and myself, though constantly exposed to the contagion in its worst form, escaped entirely, and no doubt owe it to the protection from having been vaccinated. While all the assistants and myself did all in our power to save the lives of those under our care, it would be claiming too much did we credit ourselves entirely with the unusually small death rate, when a great part, and probably the greatest part, was due to the protection from previous though very remote vaccinia. I can more than ever feel the great truth, and indorse the remarks of our efficient Health Officer of last year, Dr. Hagan, when he says that this terrible disease would be unknown did every one protect himself by vaccination. I would go further and say that the time should soon come when a person not thus protected should be considered criminally negligent of the lives of the community, and treated accordingly. In a period of twelve years' experience with variola—during which time I have made it a special study—I have never known so small a death rate, and I feel much gratified with the results.

I feel, however, that much is due to the very conscientious assistance rendered me by Mr. and Mrs. Keys and Messrs. Chester and Hickey, who were ever ready by night or day to do what they could to save the lives or alleviate the pains of the many sufferers under our charge. I wish to tender my best thanks to his Honor, the Mayor, for the very solid assistance and encouragement tendered me at all times, and his very kind and thoughtful consideration of both myself and the unfortunate ones under my care, as shown by his daily communications, which were most gratifying to myself and a source of much comfort to the sufferers, who felt that while the executive of the city had such an interest in their welfare nothing needed for their comfort would be denied. I wish, also, to thank the Health Officer, Dr. Reese, for uniform courtesy and consideration, and for his willingness at all times to second any desire and to fill any want for the good of my patients, or for my own comfort—allowing me at all times free exercise of judgment in the treatment and care of the sick. And, finally, I feel that I can say that I have the pleasant knowledge that all the unfortunate ones who have been inmates of the hospital this winter have been satisfied, and all are willing to bear witness that their treatment both by the Board of Health and by the officers of the institution was all that could be desired, and more than was ever expected.

I have the honor to be your obedient servant,

L. S. THOMPSON.

Origin and Progress of the Smallpox at San Fernando, February and March, 1888.

There have been two cases of smallpox at San Fernando and one of varioloid. It is impossible to trace the disease to a definite origin. The first patient was a man twenty-four years old. He was taken with the first symptoms while in Los Angeles on February eighth, and the next day returned to San Fernando. He was in Los Angeles only three days. Previous to that time he had not been anywhere near the smallpox for months, but was in daily communication with people from Los Angeles. The disease must, therefore, have been communicated by a third party. At first he was supposed to be suffering from pneumonia; and, owing to the fact that he usually had an acne eruption on his face, the diagnosis of smallpox was not made until February fourteenth. The next day I saw him for the first time. There was a pustular eruption all over the body, and the skin of his face was considerably swollen. Temperature, 103 degrees; pulse, 120. The disease ran an ordinary course without complications, and he was discharged cured on March fifteenth.

The second case of smallpox and the case of varioloid appeared about the same time, February twenty-third. The case of varioloid was the wife of the first patient. She had been vaccinated on February fifteenth, with success. The eruption had entirely disappeared by March fifteenth, and she was discharged with her husband.

The second case of smallpox was a sister of the first patient, nineteen years old, and eight months pregnant. I was called to see her on February twenty-third. She was suffering intense pain in the lower abdominal region, slight pain in the back and hips, and had some headache. Temperature, 102.5 degrees; pulse, 120. In a few hours she gave birth to a child. She had done a hard day's work washing the day before, so it seemed an ordinary case of premature labor. Two days afterwards, March twenty-fifth, the eruption appeared, and the house was immediately quarantined.

With the appearance of the eruption the fever did not subside, but the temperature rose, and for five days varied between 104 degrees and 105 degrees, pulse 120 to 130, during which time she was frequently delirious. The eruption afterwards became confluent, so that her whole face was one mass of pustules. On March fifteenth (the twenty-second day of the disease) she was removed to the house which her brother had vacated the same day. This was for better ventilation, and because the house could be more easily guarded. Her temperature was then 102.5 degrees, pulse 120. The next day her temperature was 100.5 degrees, pulse 80. From that time she improved steadily and was discharged cured on March thirtieth.

MEASURES TAKEN TO PREVENT THE SPREAD OF THE DISEASE.

1. Quarantine and isolation. 2. Vaccination. 3. Disinfection, etc.

1. Quarantine and Isolation.

On February fifteenth, the house was flagged and a guard placed in front of it night and day. On the twenty-fifth of February, the house where the second case appeared was quarantined. It was a hotel and saloon in the same square with the first house. There were sheds and outhouses back of the hotel, so it was necessary to quarantine nearly the whole block. To do this effectively, three day guards and three night guards were necessary. The woman who keeps the hotel is an habitual drinker and unreliable; so the guards were given a shotgun, and instructed to use it if necessary. On March fifteenth, as soon as the patient could be removed, she was carried to the house that had been occupied by her brother (the first patient). A reliable man, who acted as nurse, cook, and guard, accompanied her. Then only one other guard was necessary during the day, and none at night.

2. Vaccination.

Everybody who could be persuaded was vaccinated. On the appearance of the second case, blank forms were printed, and it was given out that vaccination was "compulsory" and free. One hundred and twenty-five people were vaccinated by myself, and a few others procured virus in Los Angeles and were vaccinated without my knowledge. Only a few who had been successfully vaccinated within a year were revaccinated, and none with success. Two families declined to be vaccinated.

[In seventy cases, virus from the Chicago farm was used; in fifty, Alexander's virus, and in five, Rafael (Pacific Coast) virus.]

It has been impossible to ascertain the exact proportion of successes, but it was somewhere between 50 per cent and 75 per cent of all cases. The woman who had varioloid was vaccinated (with success) the day of my arrival. The one who had the severe case of smallpox had not been vaccinated.

3. Disinfection, Etc.

My clothes were changed before and after every visit, hands cleansed with scrub-brush and soap, and face and hands washed in a 5 per cent solution of carbolic acid. As soon as the second case appeared I had a small shanty built, about fifty yards from any other building. It was divided into two compartments, with a separate entrance to each, and a door in the partition between them. In one of the compartments were kept water, scrub-brush, and soap, and a large jar of 5 per cent solution of carbolic acid; in the other, a suit of clothes, hat, and pair of shoes, which were worn only on visits to smallpox patients.

In the case of the two women, the hair was cut short, so that the head could be thoroughly washed. Every patient had a warm bath daily for several days before being discharged. On the last day a complete change of clothing was placed on the portico outside the house, and the convalescent, after a warm bath, clad in clean clothes, immediately left the premises.

The mattresses (five in number), bedding, and most of the clothing worn by the patients, were burned; all the clothing not burned was boiled for two hours in a 3 per cent solution of sulphate of zinc. A strong solution of copperas was used for dejecta and privies, which were afterwards douched with a one to one thousand solution of bi-chloride of mercury.

The room occupied by the patient in the hotel, and the one adjoining, and all the rooms of the other house, were fumigated with sulphur. Then the floors, ceiling, walls, windows, and bedsteads of every room in both houses were scrubbed with soap and water, and washed with a one to one thousand solution of bi-chloride of mercury. Afterwards all the doors and windows of the hotel were kept open for a week, and instructions given that the other house should be aired in the same way. (I left San Fernando the day after it had been disinfected.)

Respectfully submitted.

WEST HUGHES, M.D.

To H. S. Orme, M.D., President State Board of Health, Los Angeles.

SMALLPOX IN SAN FRANCISCO.

By S. S. Herrick, M.D.

San Francisco was entirely free of smallpox for a little more than a year, when a case was reported on Jessie Street, February 23, 1887. This was a solitary case and the city continued exempt until May third, when a Chinese passenger from the steamship "City of Sydney" was sent to the Twenty-sixth Street Hospital. It appears that several deaths occurred in the steerage during the voyage from Hongkong, one of which was four days before reaching this port, and was reported by the ship's surgeon as occasioned by purpura hemorrhagica. The case just mentioned as sent to the pesthouse May third, developed eight days after arrival in port, which gives an interval of twelve days from the death of the case of purpura hemorrhagica, and there is strong ground for presuming that the latter was really hemorrhagic smallpox. In any event, it is clear that the present visitation has grown out of infection brought by the "City of Sydney" about the end of April, 1887.

The following is a numerical exhibit of the course of the disease up to the end of June, 1888, derived from the records of the Board of Health:

Month.	Total Cases.	Male.	Female.	White.	Mongol.	African.	Deaths.
May, 1887	8	8		3	5		
June, 1887	11	6	5	10	1		2
July, 1887	9	6	3	9			3
August, 1887	6	6		6			1
September, 1887	6	4	2	6			1
October, 1887	6	2	4	5	1		2
November, 1887	33	20	13	31	2		4
December, 1887	86	67	19	79	7		10
January, 1888	224	190	34	193	30	1	27
February, 1888	115	84	31	97	18		9
March, 1888	23	20	3	20	3		4
April, 1888	22	18	4	16	5	1	4
May, 1888	8	5	3	8			2
June, 1888	11	8	3	11			
Totals	568	444	124	494	72	2	69

The vaccination history of those admitted to the pesthouse was not made a subject of systematic inquiry till January 11, 1888. From this date to June thirtieth, two hundred and forty-seven persons, excluding Chinese and school children, were received, of whom one hundred and eighty had been previously vaccinated, and sixty-seven not vaccinated. During the whole period of fourteen months twenty-nine school children were admitted, three of whom had never been vaccinated. Of these twenty-nine three died.

Justice to the San Francisco Board of Health demands the explanation that repeated efforts were made, beginning in the early course of the visitation, to have enforced the rule requiring all public school pupils to be protected by vaccination. The appearance of smallpox among these children indicated that the rule had been relaxed, and inquiry developed the fact that it was entirely neglected in some of the suburban districts. It was proposed to make an inspection of arms at the school houses, and to vaccinate there or elsewhere all who needed protection; but opposition was made on the ground that the "Board of Health had no right to use a school house for a health office." It would be unfair to say that the school authorities generally were opposed to the enforcement of the vaccination rule; but it would be a suppression of truth not to state that the Superintendent, Mr. James W. Anderson, and Mr. Thos. P. Woodward, a member of the Board of Education, were conspicuous in obstructing the inspection of the school children, by which means alone the Board of Health could be satisfied of the protection of these children.

In the month of February, Drs. Fred. W. Lux and Kate I. Howard were employed by the Board of Health to visit the public schools for the duty above indicated. Eight schools were visited, and two thousand and seven pupils examined; only four refusing to submit to the inspection. Of this number sixty-seven were found totally without visible evidence of vaccination, making $3\frac{1}{3}$ per cent of those examined. Of the remainder it may be presumed that a large proportion were only partially protected, judging from the twenty-nine pupils who were admitted to the pesthouse, only three of whom were entirely without vaccination marks. At this point the examinations terminated, for the reason above stated.

Nevertheless it is probable that the efforts of the Board of Health have not been fruitless, and that few children are now admitted to school without vaccination certificates; but with the disappearance of smallpox, and in the absence of sanitary supervision of the schools, it may be expected that there will be a relapse to the former neglect. It is now to be observed that very many parents postpone the vaccination of their children till the school age, and, recognizing it as a condition of entrance to school, entirely lose sight of its relation to smallpox.

Free vaccination at the health office is constantly provided for the public, and by the month of July the number of applicants so increased that it became necessary to employ a physician for this special work. Soon after other physicians were employed to visit houses in neighborhoods where cases of smallpox had been discovered, and offer gratuitous vaccination. Gradually the health office became so thronged, that two vaccinators were for some time kept hard at work, which continued on evenings and Sundays. The number of gratuitous vaccinations recorded from June 20, 1887, to June 30, 1888, is more than eighty thousand, at an expense of \$7,526 80 for bovine virus, and \$4,230 paid to physicians. This number includes those performed at the health office, at private houses, and at hotels, lodging-houses, factories, workshops, etc., where vaccination was requested for inmates or employés.

It is desirable to know the results of vaccination, both in the interests of the individual vaccinated and for the purpose of determining the value of the virus used. After long experience in this kind of work, I must acknowledge that my efforts to arrive at accuracy in the results have been far from satisfactory. The chief difficulty grows out of the neglect of persons to return and report. This, I presume, is the experience of most practitioners in our country; and, therefore, I regard with some wonder a report of five thousand two hundred and five vaccinations during this visitation by a certain practitioner, of which four thousand seven hundred and eighty-nine were successful, taken in connection with the following statements: "About one third were primary cases. * * * I do not consider the sore limb with swollen glands and severe constitutional disturbances successful vaccination. Nor do I consider the bloody tumor, nævus, or raspberry excrescence, the thin, yellow, and irregular crust which falls off in eight to twelve days without leaving a forcated and striated cicatrix, a successful inoculation. It is only where I found a circular vesicle with depressed center and circumscribed oreola forming in from six to ten days, or an umbilicated striated kine-pock mark, that I passed them and issued a permanent certificate." My own experience in September, 1887, was as follows: Vaccinations performed, one thousand three hundred and thirty-six; reported for verification, four hundred and seventeen. Bovine virus was used from two different establishments; one of which gave one hundred and thirty-five successful results, with fifty-seven failures—all primary vaccinations. The other gave one hundred and sixteen successes and one hundred and nine failures—all primary, also. My record from March 6 to June 30, 1888, gives two hundred and sixteen primary vaccinations; one hundred and thirty-five reported for examination, showing sixty-five successful and seventy failures.

The general results of vaccination by the various physicians employed by the Board of Health were not highly encouraging, and, therefore, the Board was gratified to learn, in January last, that a vaccine farm was in successful operation at San Rafael. Before deciding to use the new product, it was deemed advisable to know something of the management of the establishment, and the present writer was sent on two separate occasions to make an inspection. At the first visit there was opportunity to observe a few calves, a few appliances of the rudest nature, and the inoculation of one animal. It was learned that the virus had been used for a short time, and to a very limited extent, on children at San Rafael, but no record of results had been made. At the next visit the inspector was not allowed to make further observations, in order to guard against any possible rivalry. The inspector was surprised to learn that there could be "trade secrets" in this business when conducted by a member of the medical profession, after observing a vaccine establishment some years ago at New Orleans, which was open to the public without reserve.

None the less, the San Rafael virus was given a fair trial by the Board of Health, but the various public vaccinators reported almost uniform failure, and it was soon abandoned. It is greatly to be regretted that this establishment could not have been brought to a fair pitch of efficiency, as it is the only one upon this coast, and the virus from eastern farms has lately proved more unsatisfactory than ever. In fact, for several months a particular vaccine, which had been highly praised in earlier months, has been found later, in my hands, to give a majority of failures in primary cases.

In the control of smallpox our main reliance is in vaccination. When the disease is absent young children can be vaccinated at convenience and there is little call for secondary vaccinations. In case of failure with children the operation can be repeated in a leisurely way, until successful. But in the face of pestilence sure results are an urgent want—there is no time to repeat uncertain experiments. Especially important is certainty in secondary vaccinations. With a virus liable to fail in 25 to 50 per cent of cases, no one can feel sure of safety as long as failure takes place. Repeated failure may be due to fault of the vaccine rather than protection by previous vaccination, and delay is fraught with danger.

In my judgment it is greatly to be regretted that humanized vaccine has fallen into discredit. Unfortunately there was ground for distrust of this source of supply during a limited period of the past, as there still is upon the Hawaiian Islands, owing to the prevalence there of syphilis. Careful study of the history of vaccinal syphilis in Europe convinces me that such accidents grow out of culpable carelessness in the selection of vaccinifers, while experiments made with virus taken from children known to be syphilitic were rarely successful, unless there was admixture with their blood. During the late civil war in this country there were numerous occurrences of "spurious vaccination," a portion of which were probably syphilitic in character; others were of the nature of pyemia or septicæmia; while the majority were attributable to the scorbutic condition of the subjects of vaccination. It is certain that the worst results followed vaccinations performed by soldiers on each other, without the slightest care or discrimination in the selection of virus; and it is highly probable that no syphilitic result followed vaccination performed by medical men with vaccine taken from a young child.

Undoubtedly the publication of such accidents has led to greater care in the selection of vaccinifers and prevented, for the last fifteen years, recurrence of vaccinal syphilis. Speaking from personal experience and observation, though previous to 1887 connected mostly with vaccine from human sources, and so far without meeting a case of vaccinal syphilis, my opinion is that danger of this accident is imaginary rather than real, provided due care be taken in selecting lymph from healthy children, never before vaccinated, between the ages of six months and six years, without admixture of blood. With this lymph in primary vaccinations I have not had one failure in more than a year up to the present writing, September twenty-first, nor any irregular results. After failure with the bovine virus, it is my custom to suggest the use of human lymph, and this is often accepted. In primary vaccination, the first trial has been invariably successful.

The lymph used by me is taken from normal vesicles on healthy children seven days after vaccination. Puncture of the vesicle at this stage is followed by the flow of two or three drops of the lymph, which is received on points. Those previously charged with bovine virus are used for this purpose, after washing. As there is almost daily opportunity to renew the supply, the virus is always fresh.

Besides the uncertainty of the bovine virus, there are other features of common occurrences, which are not pleasant and which are not found in the human product. The sores are apt to be quite serious in character; a considerable eruption on the body is liable to take place; and the points of vaccination frequently develop a raspberry-like excrescence (sometimes a true ecchymosis), which may remain for weeks, and is often mistaken by the inexperienced for the normal result of vaccination.

It is claimed that the protection afforded by bovine vaccination is more positive and lasting than that afforded by the Jenerian virus after numerous propagations in human beings. It is true that virus at one or only a few removes from the animal, produces more energetic effects than that obtained after many successive human propagations, and I shall not deny that some deterioration in the protective power of vaccination resulted in the long period which elasped from the time of Jenner up to the time when animal vaccine began to come in common use in this country. But when it is claimed that the bovine virus gives certain and indelible protection from smallpox, I must dissent. In the April (1888) number of the "Pacific Medical Journal" I gave six instances of smallpox which occurred during the present visitation of the disease in San Francisco after recent and successful vaccination with the bovine virus. But in order to obviate any possible deterioration of humanized vaccine, it is sufficient to recur occasionally to the bovine source of supply.

The conclusion reached by me, after more than twenty years' experience with both kinds of vaccine, is as follows: The danger from human lymph taken by a careful and experienced vaccinator is imaginary rather than real. The results with this virus are so much more certain and regular, that it should have the preference whenever smallpox is threatened, and always have the preference in secondary vaccinations. It should here be explained that I never use humanized virus without the knowledge and consent of persons old enough to judge for themselves or for those in their care, and that most of my work is done with bovine virus, in deference to popular demand.

On December twenty-ninth the disease had gained such general diffusion over the city, and the cases were so numerous, that the Board of Health felt justified in declaring it epidemic. Subsequent action, declaring the disease no longer epidemic, was taken March sixteenth.

In the early part of January the number of sick at the smallpox hospital exceeded one hundred, and soon after the demand for further accommodations became so pressing that an additional building was hastily erected, so that the capacity was doubled, or equal to the needs of two hundred patients. Before this time the Board had found the monthly fraction of its annual allowance from the city treasury far below its actual wants, and relief was sought and obtained from the Urgent Necessity Fund. The total amount drawn from this fund, expended on account of smallpox solely, was $40,000, in addition to $5,000 appropriated for the maintenance of the smallpox hospital. The following were the principal items of expense: Bovine virus, for gratuitous vaccination, $7,526 80; paid to additional physicians for services in vaccination, and other duties, $5,673 32; maintenance of smallpox patients, $20,199 99; cost of a new building, erected in January, as an annex to the pesthouse, $7,561 37; disinfectants, $961 60; horse hire, $1,170 50; paid additional employés, $4,515 68; total, $47,609 26. The excess above $45,000 was made up from the ordinary funds at command of the Board.

To the above amount should be added the value of the lives sacrificed, for every human life has a value as capital for the production of wealth, usually estimated at $1,000 per capita, and in California this is a low estimate. Here would be $69,000 more lost.

Besides, the Pacific Mail and the Oriental and Occidental Steamship Companies declare that their extra expenses, due to quarantine, from February 1 to May 1, 1888, were $75,000 to each company, or $150,000 to both, in addition to the cost of maintaining Chinese passengers for other periods of ten days, whenever cases of smallpox happened to occur on their ships *in transitu* during the season. It is probable, therefore, that these two companies have suffered damage to the amount of $200,000 during the period of May 1, 1887, to June 30, 1888. The total loss to the city and to the steamship companies therefore considerably exceeds $300,000.

Some comments on the foregoing facts may now be appropriate. Theoretically speaking, smallpox is a preventable disease, but not absolutely so in a free country like ours. Its existence is a part of the price of our liberties, but, in the present state of knowledge on the means of prevention, an epidemic of the disease means bad sanitation, and is discreditable to any civilized community. It is a poor excuse to say that San Francisco was not prepared for it. No American city of 300,000 inhabitants, and an assessed value of $273,000,000, has a right to plead want of preparation to control smallpox. The needed pecuniary means, which are abundant, should be made available *before the enemy has come;* the sanitary knowledge required is the property of the world; suitable persons to put both in operation can be found, if wanted.

The Health Department of San Francisco was organized nearly twenty years ago, when the population was a little more than one third its present number. During this period it has lost rather than gained strength, for the place of Assistant Health Officer has been abolished. With increasing territory and population the number of Health Inspectors has remained only six. Experience shows that Chinatown and the cheap lodging houses are generally answerable for the introduction of fresh cases of smallpox, and no such sanitary force is adequate to keep them under proper supervision.

The city has a population of nearly three hundred and fifty thousand, and a sanitary force available for outdoor duty of one medical officer and six non-medical inspectors. Systematic inspections are out of question. Nuisances and sickness cannot be sought out and prevented; they can only receive attention when reported by others. As a natural consequence pestilence sooner or later gets the upper hand. This is the event for which no preparation has been made; its cost, the " pound of cure " from neglect of " the ounce of prevention," represented by more than $100,000, including the value of human lives sacrificed.

The Health Department at all times offers free vaccination to those who visit its office at the New City Hall. Doubtless free vaccination costs less than the expense of a few cases of smallpox, and the preventive measure ought to be made as general as possible. In other words, it is expedient to make it convenient for people to avail themselves of the offer; or, to be more precise, there should be vaccination stations in selected parts of the city's extensive territory. It would be work enough for one medical man to attend six different stations in rotation, for one day in the week at each, besides attendance for the same purpose at the health office every day in the week, including Sundays. The same officer could also inspect the public schools, and prevent a repetition of twenty-nine cases of smallpox among the pupils, with three deaths, according to late experiences. The estimated money value of these three lives would about equal the cost of this service for one year, without counting the cost of maintaining the whole twenty-nine at the pesthouse.

Inasmuch as San Francisco receives occasionally cases of smallpox from the interior country, it is obviously out of the power of sanitation to keep the city constantly free of the disease. As to steamships engaged in the Chinese traffic, it is a different matter. A thorough system of vaccination of the Chinese passengers before sailing would effectually prevent the importation of cases at this port. The effective disinfection of their personal effects after arrival would complete the needed preventive work. But it must be understood that humanized virus is to be used, instead of the commercial bovine article, and it would be the work of a competent medical man to conduct the vaccination of children at Hongkong, so as to provide a sufficient supply when wanted. It is quite within bounds to assert that the two steamship companies might have avoided the repeated introduction of Chinese effects with smallpox during this period, at an expense of $200,000, by the expenditure of much less than $10,000, as compensation of a competent sanitarian.

The cost of this visitation of smallpox to San Francisco and to the steamship companies may be regarded as a penalty for violation of sanitary laws; also as the price of a lesson in sanitation. The important question is, whether, in either or both senses, it shall fail of effect in preventing a repetition.

REPORT ON SMALLPOX IN STOCKTON.

By C. A. Ruggles, M.D., Health Officer.

The first case of smallpox that came to my notice in Stockton was on October 27, 1887—Mr. Geo. H., a clerk, aged twenty-two years. The origin of it I never could satisfactorily ascertain. There were ten other members of the family. The conditions were extremely favorable for perfect isolation. The patient was placed in the upper story of the dwelling. The members of family occupying the lower part of residence were all successfully vaccinated. To the cheerful compliance and hearty coöperation on the part of the family in all quarantine regulations am I much indebted for a successful confining of the disease to that one case. It was of confluent type; was quite severe; but he recovered.

Exemption from the disease lasted but a short time. On January 3, 1888, Miss Nellie G., aged sixteen years, was attacked, and, as in the preceding case, the origin was never ascertained. Her case ran the usual course, and terminated in recovery. Successful isolation was maintained. No other member of the family took the disease.

From this time until May twenty-first there was no period that we did not have one or more cases. In all, there were thirty-one cases—seventeen males, and fourteen females—the oldest, seventy years, the youngest, five months old. There were three fatal cases.

The disease, generally, was of a mild type, a few only being severe. Four of the patients were colored persons, and had it very severely, two of the four terminating fatally, one at the age of seventy years.

A mistake in diagnosis furnished four cases. A mother, believing her son had chickenpox, gave no notice of his illness, thinking herself equal to the task of treating such a slight matter. It did not progress satisfactorily to her and some of her neighbors, and I was called in to verify a case of varioloid in the beginning of the pustular stage. To this case three light and one very severe case were clearly and positively traced, thus confirming the statement that from a very mild case a dangerously severe one may arise.

Seven cases were clearly traced to an importation from Gilroy. One case, in second day of papule, came from that town in cars, from the depot in carriage, and as far as I could ascertain no case arose from it, leaving one to draw the inference that the communicability of the disease is somewhat exaggerated.

As to the time when infection may take place, there is great diversity of opinion. Some authors contend that it may begin even during the period of incubation; some that the period of suppuration is the time of infection; others claim the infecting period is during desiccation, and others say "little is to be feared until the vesicles are fully formed." While I do not now dispute either theory, I do say that after much experience in this disease, extending over many years, I have never seen a case where I had any reason to believe the infection took place during the period of incubation. At the same time I am firmly of the opinion that the last mentioned theory—that infection does not take place until the formation of the vesicle—is dangerous, as I have positive evidence of two cases that became infected on the first or second day of the papule.

It would seem a waste of time and an insult to the intelligence of the reader to discuss the question of vaccination as the only preventive measure that is known to successfully avert smallpox. But how and in what manner it should be used is a matter deserving thoughtful consideration. Of late it has become very fashionable to extol bovine virus on account of its purity, and the impossibility for it to produce sepsis, and to discard humanized virus on account of its impurity and probable blood poisoning qualities. During the last epidemic, and others that preceded it, I saw many bovine virus points discolored, which I discarded, believing it unsafe to use them thus partially charged with blood of the animal and other foreign matter, thus negativing, in a certain degree at least, the purity theory.

Experience and observation have shown me that bovine virus will fail to produce the desired effect in about 25 to 30 per cent of cases. I am of the opinion that humanized virus, taken from the arm at the right time, that is, on the eighth day, when in the vesicular stage, entirely free from any accidental bleeding, with nothing but pure lymph, is as equally free from danger as the best of bovine, and is more reliable than bovine, the failures to succeed in primaries not amounting to 5 per cent, and not as furious and severe in its operation and equally protective in its effects. If again, as I have been in the past, situated where I must have sure and reliable results from vaccine, I should use humanized virus.

It is well understood that no two cases are alike, so the treatment must be necessarily different. But the general plan was of a supporting and tonic character. Beginning early with quinine and the most easily digested nutriments, very soon adding whisky or other stimulants, during secondary fever with a high temperature, I gave antipyretic doses of quinine, with good results. I always kept my patients in a dark room, paying due attention to good ventilation. The face was covered with a paste of simple cerate and subnit of bismuth, with the good effect, I believe, to prevent the disfigurement by pitting.

The thirty-one cases were so situated socially that I sent only one to the smallpox hospital. I was able to maintain such perfect isolation by placing guards, flags, and notices, as not to necessitate a proceeding so unpleasant and repulsive to patients and friends, though increasing to a great degree the expense.

The whole expense to the County of San Joaquin and the City of Stockton, and none was spared that was necessary to stamp out the epidemic, was much larger on account of maintaining separate isolated hospitals than it would have been had all or a majority of the cases been sent to the hospital. Including salaries of night and day guards, medical attendance, nurses, funeral expenses, vaccine and vaccinating, the expense was $2,139.

One case was so uncommon, as in my own experience I had never met one like it, nor had any of my professional brethren here, that I make mention of it. A child two years of age had a very severe attack of confluent variola. It went along quite satisfactorily, with the usual amount of swelling of eyelids and other parts of the face, till one day, when the swelling of the lids had abated, I was able to detect on both corneas a pustule which produced total blindness. With all due respect for our calling, I will say I was glad my patient died from exhaustion on the sixteenth day.

The safety of the community intrusted to us demands the utmost care on our part in the "finale" of a case of variola. A patient is dangerous and capable of much mischief as long as a scab remains on his person, and he should not be discharged until by the closest examination it is ascertained that he is perfectly free and clean. All clothing used by patients, sheets, pillows, etc., should be burned. We cannot be too destructive. Nothing affords as much security against smallpox germs as fire. In fumigating the apartments occupied by smallpox patients I usually use chlorine gas, or sulphur burned with alcohol. The walls, floors, and other wood work are to be thoroughly washed with chloride of lime and water, and then repainted or varnished, and walls newly papered. It is impossible to be too particular and thorough in this last proceeding.

To make the management of a variolous epidemic a success, we must have the hearty support and coöperation of the municipal authorities, and when a measure to be taken is deemed by the Board of Health or Health Officer to be actually necessary the cost or expense should be of secondary importance.

CHARLES A. RUGGLES, M.D.,
Health Officer of Stockton, Cal.

THE EPIDEMIC OF SMALLPOX IN ST. JAGO DE CUBA IN 1887.

By Philip C. Hartmann, M.D.

St. Jago de Cuba is one of the oldest towns in the West Indies. It is nearly four centuries old. It has no drainage except the surface. Many of its streets are filthy, and but for the heavy rains, that take place at certain seasons of the year, and which make then every street a torrent, things would be still in a worse state: and in regard to hygienic measures nothing has ever been done. The reigning disease is the malarial, and in some years the yellow fever is very fatal to strangers and the unacclimated. This city has a population of forty thousand, of which eleven thousand are white, the rest negroes and mixed races.

In the spring of the year 1887 the city was stricken with an epidemic of smallpox, which, for its severity, will be for a long while remembered. The first case was a military officer, who arrived here in a steamer from Havana and Baracoa. He was landed without ceremony, and lodged for treatment in a house near the center of the city, where he was attended without any more precaution than if it had been a case of intermittent fever. The writer of this article, on the very day of the landing of this individual, went to the Governor and explained to him clearly the dangers that threatened the city, and the calamities that would arise if steps were not immediately taken to have the sick man removed and isolated. This step was the more urgent, as the majority of the people were either not vaccinated, or had not been for a long time. A note was taken of this, and that was all that was done.

Some days later new cases commenced to be reported. One of these was taken to the Centro Benifico, a small hospital sustained by a society for its own benefit. This hospital was situated on a main street, and back of it was an alley inhabited mostly by colored people, with very few vaccinated ones among them. The waters used for washing and bathing this patient were thrown out into this alley, and in a few days there was hardly a house in it that had not some of its inmates down with the disease, and many died.

From this focus it commenced to spread in all directions, causing much alarm among all classes. The attention of the authorities, by the clamor of the press, was at last called to the case, and vaccination committees were appointed to take charge of the different districts and vaccinate all those that were not protected, even had it to be done in a compulsory manner: but so great was the fear of the operation, especially among the negroes (but not limited to them alone, for many of the whites held the same ideas, viz., that vaccination brought on an attack of smallpox in all who attempted it during an epidemic of the disease), that on the approach of the committees the children were carried away or hidden by their mothers and neighbors with the pious object of saving them from the virus of the dreaded vaccinators. Thus very many remained unprotected and they soon fell victims to the scourge by hundreds.

Now, in the portion of the city inhabited by the wealthier and better educated class, there was not a single case, owing to the care that had been taken in regard to timely vaccination.

Never was any attempt made to isolate the sick, nor any other means taken to prevent the spread of the disease. In the month of June, two hundred and six died; July, three hundred and sixty-four; August, two hundred and thirty-four; September, eighty-two; October, twenty; total, nine hundred and six. The number of persons attacked was considerable, many more than was reported (two thousand one hundred and ninety-four), as the physicians, regular and irregular, who attended did not report but a small number of the cases that came to their notice.

P. C. HARTMANN, M.D.

REPORT ON ANIMAL VACCINATION.

By Henry A. Du Bois, Ph.B., M.D., of San Rafael, California.

This report resolves itself into two parts. First, a brief consideration of animal vaccination; and second, a statement of what has been so far done at the only vaccine station on the Pacific Coast.*

ANIMAL VACCINATION.

It is now ninety-four years since Edward Jenner vaccinated James Phipps with virus taken from the hands of Sarah Nelmes, and tested the protection thus given the former by inoculation with smallpox virus, without effect. Since this event, an event ever to be remembered in the science of preventive medicine, virus has been taken from children and used for the protection of the inhabitants of every civilized country from the ravages of smallpox. Almost from the date of the discovery doubt was thrown on the protection thus given. Jenner believed that it lasted throughout life, and inoculations thirty years later than the original vaccinations were certainly, in many cases at least, unsuccessful; while if we give credence to the reports of certain public vaccinators, who report 80 to 90 per cent of secondary vaccinations as successful, our opinion must be that the protection given by this operation is limited to a very few years at most. The general opinion of those competent to form an unbiased judgment, from an impartial study of all the facts, seems to be that the protection lasts in some cases for life, but more often diminishes as time goes on, so that it fails to give efficient protection after a certain time, which varies in each individual case. Almost all authorities agree now in advising revaccination; some once, while most consider repetitions of the operation at various ages more prudent, if not absolutely necessary to give full protection. There are, however, some able men who still maintain that the protection given by this operation, if properly performed with virus taken directly from the cow, or only a few removes from its origin, and at once introduced into the system of the recipient, is practically for life in most cases, and found their opinion on the following facts: Jenner's vaccinations, and those of his immediate followers, were generally tested after a longer or shorter time by inoculation, and almost uniformly without success. Since this period statistics show that smallpox in those periodically vaccinated is by no means uncommon, and apparently until a few years ago the percentage of those thus becoming diseased increased steadily. This they explain by the want of proper care in the performance of the operation, and by the use of imperfect virus.

I think any one who will carefully examine the literature of the subject will agree with me when I say that physicians generally for many years after Jenner's discovery knew more about this operation than they do now. That it was not then, with the memories of inoculation still fresh in their minds, considered a trifling one, that could be safely intrusted to any untrained operator. Jenner certainly never wearied in urging that no one should be allowed to vaccinate until he had been first properly trained. Further, I think that humanized virus can be materially improved or impaired by the physical condition of the children, through whose system it is passed, and that on the whole virus generally in use in this country fifteen years ago, before the introduction of bovine virus, showed a great difference in its effects when compared with the action of the latter, this producing vesicles resembling in character those of the classical description given by Jenner. My own opinion is that want of instruction lies at the bottom of this whole matter. The medical student of the present day really knows nothing of vaccination, and the practitioner too, generally, only what he has learned by a not too fruitful experience. I can find no positive evidence that virus must *necessarily* deteriorate by its continued passage through the human system, but there seems the strongest evidence that humanized virus in England and in this country at least, and probably in other countries also, before the introduction of animal virus had a shorter period of incubation, a less typical vesicle, a less defined areola, and caused less constitutional symptoms than in Jenner's lifetime. Certainly in comparing a personal experience of a good many thousand cases vaccinated with humanized lymph from 1861–8 with a more limited number in recent years, in which animal virus has alone been used, the difference has been marked, though one chiefly of degrees.

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*Note.—This report is made at the request of Dr. Orme, President of the State Board of Health of California. It was first intended to include the full consideration of the nature of virus, as well as the technique of its production, storage, and distribution, but as this plan involved a number of colored plates to make the appearances of the characteristic vesicles intelligible to the reader, which, perhaps, fortunately for him, the State was not willing to pay for, I have reserved most of the material collected relating to this portion of the subject for publication elsewhere; and have aimed here to be as brief as the subject would admit of.

Statistics in England show a gradual lessening of protection, or else an increased infectiousness in smallpox. Revaccinations seem now required at shorter intervals than for some twenty to thirty years after its first introduction, at least such seems the case so far as a comparison of the effects of subsequent inoculation in early times with the apparent necessity of frequent revaccination in the present. As this test is not available we cannot, of course, ascertain with the same degree of accuracy the protection afforded. As to the frequency of revaccination, there are no statistics to enable us to determine the average period of protection with any approach to accuracy, and any regulations on this subject for the benefit of the public should, of course, be based on the least period of time, not on a general average of time that protection is given. Perhaps vaccination at three to six months after birth, at twelve years, again at twenty to twenty-five, and perhaps after forty, with revaccination at any age before or during an epidemic, would comply with the result of the experience of those who have devoted most thought to this subject.

There seems to be evidence, chiefly from Belgium, to show that by the use of animal virus as great if not greater protection can now be given than was in early times afforded by the virus first introduced by Jenner. It must be remembered that in this country animal vaccination has been largely in use for fifteen or more years. So in any comparison of the activity of these two forms of viruses, due allowance must be made for its influence on the humanized virus of the country at large. We can, in fact, in this country at least, obtain no virus humanized for a length of time to compare the animal virus with. So repeatedly have the profession gone back to the cow, that it is doubtful if a single case of cowpox can now be found in the United States, whose virus has come from Jennerian stock.

What are the advantages and disadvantages of using either virus, and which, on the whole, is preferable? We have already alluded to one decided advantage—the greater activity of bovine virus, properly propagated and stored, when successfully introduced into the system. By this I do not wish to be understood to mean that as ordinarily used it will "take" in a greater proportion of cases. Very little experience is needed to convince one that this is the exact reverse of the truth. The introduction of a virus from one species into the system of another with a lower body temperature always presents more difficulties than in the introduction of the virus of the same species. What I mean is that *when successfully introduced* its action is more thoroughly constitutional, and the local effects are the exact counterpart of those described as typical by Jenner, and which resisted inoculation many years subsequently. I have here, I believe, presented what to my mind is the chief advantage of animal virus, as well as its chief disadvantage, its thoroughness when inoculated, and the difficulty attending its inoculation.

It may, perhaps, be well to illustrate this briefly. Buist, of Edinburgh, holding an official position as teacher of vaccination to the local Board, says, in a very excellent original work recently published, that four scratches one third of an inch long and three fourths of an inch apart, made with a needle, will, if the virus is taken from a healthy child (alongside), at the seventh day produce four good sized vesicles, causing cicatrices covering, collectively, at least half an inch square, while if the lymph is half an hour old only one or two vesicles will form, and these much smaller in size, and that to secure results equal to those of the fresh virus at least forty-eight scratches, close together, will be found to be necessary. The directions that he gives for the use of all stored virus, humanized and animal, are precise and worthy of note, especially in this State, where the "*vaccine rake*" seems the favorite instrument. The directions are there officially issued, and direct that the arm shall first be well *washed* and *rubbed* until dry and reddened. The vaccine virus is then applied and the scratches made through it with a *new* needle, so as not to draw blood. The virus is rubbed into the scratches with the eye of the needle, which is then thrown away. When primary vaccination fails, he directs the operation to be repeated with arm-to-arm lymph, as he justly says that even apparent failures are proved to exert some constitutional influence, which can only be overcome by a more active material, while in partial failures he recommends a second vaccination a few days later, which even when no vesicles result hastens the formation and increases the size of those resulting from the first vaccination. Another comparison of these two forms of virus shows that convenience may sometimes be in favor of one, and at other times of the other. Thus, with a compulsory vaccination law, strictly enforced, arm-to-arm vaccination is practicable, and can be practiced by a trained corps of vaccinators, thereby avoiding much of the danger incident to the use of humanized virus. In this country, with no such law, and with no special training required of the operators, these advantages do not exist. Arm-to-arm vaccination becomes always a troublesome operation, and often impossible, forcing us to resort to some form of stored virus. Bovine lymph, on the other hand, can always be had. Calves can be selected, and, with a thermometer, the progress of their inoculation can be watched, and only virus from typical vesicles need be taken. The quantity of virus is also under control, a very important matter during an epidemic. These are undoubtedly great advantages, but they are unfortunately nearly all neutralized in this State. The State neither owns, controls, nor exercises supervision over any vaccine station. Health Boards, unfortunately, are political bodies, their members being, as a rule, selected, not for their reputation in preventive medicine, but rather for their political influence. Virus is supposed to be bought in the open market. The cheapest reliable article is supposed to be secured. By whom and how propagated few Health Boards or physicians ask, and if they received a full reply, are not competent to decide as to whether a virus had been propagated with due care and skill, and there is no official authority to give them this information. Virus is found in the market opposed to virus, until, as Dr. Martin truly says: "In times of great demand (the time above all others when only what is known to be the best should be purchased) certain propagators have found this method" (alluding to his method of propagating virus by numerous small single vesicles) "far too old fashioned and 'unbusiness like' for their views. An animal must be made to yield fifteen thousand to twenty thousand points, or none."

He goes on to say that a full grown cow is selected and large sores are made, which, when inoculated, give rise to compound vesicles which frequently coalesce into one or more large sores, giving out an enormous supply of colorless serum containing few vacciniads, their place being supplied by pus cells and other septic matter, the product of inflammatory action. Such virus readily produces a powerful local action, not, however, the typical vesicle; often causes deep ulceration and resulting fever; is not infrequently accompanied by a general eruption, which can be communicated to others, causing sores difficult to heal, and leaving permanent scars. Virus thus produced is *cheap*. Virus produced from single vesicles, yielding only two hundred to three hundred points to an animal, and requiring to be taken slowly, must always be dear. So long as virus is judged by the *amount* and not by the *kind* of constitutional and local irritation produced, and so long as cheapness is demanded before quality, so long will vaccinations frequently present ulcerations accompanied with high fever. Smallpox may, as in a recent case, be contracted with "a splendid sore" on the arm, and thus the distance between the office of the public vaccinator and the pesthouse may not be far. This subject will receive explanation when we come to a consideration of the vaccine microbe and its spore.

There is yet another comparison to be made; and here everything, I believe, is in favor of the use of properly prepared bovine virus. Certain diseases can be communicated by inoculating blood. Syphilis, leprosy, eczema, erysipelas, repeated experiments have shown, can thus be communicated. Tuberculosis, it is probable, can also be thus transmitted. Whether any of these diseases can be transmitted by the liquor sanguinis contained in the vaccine vesicle, and in which the solid bodies which are proved to transmit the contagion exist, is not certainly known.

Dr. Cory, of St. Thomas Hospital, London, inoculated himself with syphilis, to show that pure vaccine virus contained nothing but virus; but it is by no means certain that, with all the care which he doubtless took, that he did not also inoculate blood. Practically, blood may exist in apparently pure virus. A careful microscopic examination is the only certain method of ascertaining its absence. This, obviously, cannot be made use of every time we vaccinate a child. Therefore, with every precaution we may take, we may inoculate blood; and thereby, if not in the lymph itself, transmit another disease. Statistics fortunately show that this seldom occurs. Some twenty-four cases have been reported in England, and about three hundred on the continent. I have no information of the number that have occurred in this country. Bovine virus is entirely free from this danger. Calves rarely have tuberculosis, veterinarians state, though some varieties of cows, especially after calving, are very subject to it, the proportion, according to Dr. Law, a United States Government Inspector, being as high as one half. If the animal is slaughtered from whom the virus is taken, and before its issue, as is done by the State in Belgium, this danger is entirely done away with.

To sum up, then, I would say that, in my opinion, bovine virus propagated for *quality* only, by a competent physician, under proper official supervision, while it presents certain objections, yet on the whole is more reliable than humanized virus. It is entirely free from the danger of producing other diseases, and much more convenient than humanized lymphs, especially in this country, for all public vaccinations. Where it fails, the virus used being known to be active, and revaccination a few days later is unsuccessful also, arm-to-arm lymph should undoubtedly be tried. To use animal virus successfully its introduction must be accomplished. A careful examination of fourteen thousand ivory points used during the late prevalence of smallpox in this State showed very considerable quantities of virus remaining on eight thousand—considerably over half, it will be seen, of the whole number—sufficient, even after the points had been washed several times in cold water and bleached by a solution of peroxide of hydrogen, to well coat the points.

To preserve virus, dryness and an even temperature below 60 degrees Fahrenheit are necessary. There is no possible objection to the thorough drying of the virus on the points, provided that the necessary care is taken to remove it all when it is used. This is easily effected by tepid water, or glycerine and water, and allowing the points to remain moist for a few minutes before using. After using it is desirable to rinse the points in water to be sure that the coating is all removed. Dr. Martin directs that the virus shall be mixed with the water on the point by means of another point or a lancet. *Failure to remove the virus is a more frequent cause of want of success with animal virus than all other causes combined.* Warlomont gives an account of using virus that had previously in other hands failed, by moistening it with glycerine and water and allowing it to remain for twenty-four hours under a glass cover in a warm room, when it proved very active. Dr. Salmon, Chief of the United States Bureau of Animal Industry, writes me that in his opinion the best way of preserving animal virus is by its thorough drying on quill or ivory points, and its subsequent protection from changes of temperature. Dr. Winslow Anderson, of San Francisco, one of the public vaccinators, tells me that he uses glycerine and water, and has recently tested some Pacific Coast vaccine and obtained a typical vesicle with a point which had been fifty days in his office. I have used successfully on calves and children virus much older than this—in one case fifty-eight days, in another ninety days, and later one hundred and fifty days—with as good results as to type of vesicles and yield of virus as I have obtained with virus a few days old, and Dr. Martin states that he has successfully used virus dried on ivory points a year old.

Passing over the history of the introduction of animal virus, as well as the technical methods on which its successful propagation depends, which latter, though simple, involves constant attention to minute details, which would be of no interest to the general practitioner, and which, to make them thoroughly understood, would require much space and a number of carefully executed plates, I come to the theoretical portion of this subject; and first, what is vaccine? How does it act on the human body so as to render it insusceptible to the contagion of smallpox? A brief statement of the present state of opinion on these subjects, and a still shorter account of the establishment of the first vaccine station on this coast, will close this report.

THEORY OF VACCINE PROTECTION.

The active agent in vaccine virus can be separated by an earthen filter, and is found to be solid, not fluid—so much experiment seems to prove. This solid is believed to be a vegetable germ, because it has the power of reproduction, which inorganic matter has not. It is believed to be vegetable in its nature, from its close resemblance to yeast, and to certain fungi, and to be an air absorbing spore, and not a full developed microbe. While the microbe is readily cultivated in solid as well as fluid media, the spore or germ is found difficult if not impossible of reproduction outside the body. It is readily developed, however, into the mature microbe, or its development can apparently be stopped at certain stages; each of these stages seems to produce a characteristic coloration when the cultivation is made in a solid media, as in gelatine or agar-agar. These colors, so far as observed, are white, yellow, orange, and brown. The action of all of these colored cultivations, when inoculated into the system, differs greatly from that produced by the fresh virus transferred at once from arm to arm. They seem also to differ in some respects one from the other, though so far the exact differences have not been fully studied. Thus there are found a colorless virus, taken early (before the eighth day) from the vesicle; a cloudy or white virus, taken after the areola forms. and which is also produced by artificial cultivation; and the yellow, orange, and brown viruses, produced by cultivation outside the body.

It may be asked how does this spore or germ of a microbe produce a disease in man, and is the disease produced smallpox, softened and modified in its action, but essentially smallpox still, or is it a new disease which produces such changes in the human system as to unfit it to receive the germ of variola. Briefly we may say that this spore entering the system in "true vaccine," develops into the microbe by absorbing free oxygen from the cells of which the body is made up. This oxygen the cells part with, but only after a certain resistance, so that if the spores are only few in number and of feeble vitality, few succeed in developing into microbes. Most of them are starved and die. Two things happen, however, with those that live. These take oxygen from the cells for their own growth, and in doing so give out a specific toxic alkaloid or ptomaine, which in its turn, so to speak, stupefies the cells, so that they give up their oxygen with less resistance. This mutual action goes on until no more of this poisonous alkaloid is formed by the germ, because it can obtain no more free oxygen from the cells. The cells unpoisoned retain their oxygen, while without it the spore remains a spore, and does not develop into a microbe. How this ptomaine causes the cells to give up their oxygen is so far unknown. Its action seems to be upon the bioplasm—the living jelly of which all animal and vegetable life is built up.

Such is the theory advanced by Dr. Salmon, of Washington, to explain contagious diseases produced by air absorbing microbes. If true, it must be able to explain incubation, or the latency of a virus—the protection given for a longer or shorter period—together with succeeding susceptibility, as well as to account for the enormous increase of the virus in the body, and for the identity of each contagious disease. If it does all this, it must do still more, to entitle it to our belief. When we cultivate the germ outside the body in a suitable medium supplying it with oxygen, if this theory is true, it should produce a soluble alkaloid or ptomaine. If it does this, such specific ptomaine, being soluble, can be separated from the germs which produce it; and, if isolated and injected into the body, should produce such a change in the cells as is produced when it is formed within the body by the germs themselves. Dr. Salmon claims to have cultivated the germs of hog cholera in a fluid medium to full development, and then by a certain degree of heat to have destroyed all microbes; and yet by injection of this fluid in pigeons—very insusceptible to this particular contagion—to have produced this disease. In other words, to have produced hog cholera by a soluble chemical alkaloid or ptomaine, which had previously been produced by the artificial culture of the germ of this disease outside of the body. The effect of the action of the ptomaines of various pathogenic microbes are more or less lasting on the cells, and while under their influence they are not susceptible to the particular disease, for the reason that no more spores can obtain the necessary oxygen from them to enable them to develop into microbes, and hence no more ptomaine is produced. This is, however, thought to be true only of moderate doses. Large doses seem to be able still to poison the cells and to take more oxygen from them. The cells apparently become accustomed to the action of the ptomaine, and this tolerance can be increased by successive inoculations of increasing strength, while the cells will be affected if the dose of the ptomaine is increased too rapidly. *The tolerance of the cells for the particular poison is, therefore, the cause of subsequent protection.*

A period of protection is thus accounted for, of longer or shorter duration, according to the nature of the specific microbe, as well as to the size of the dose and the thoroughness of its introduction into the system. When spores are introduced into the body, a certain time elapses before they have developed sufficiently to have poisoned the cells by their resulting ptomaine, and to take their oxygen. This period is that of incubation, while it is followed by that of the development of the symptoms of the disease. A period of fermentation thus exists, in which a poisonous alkaloid is formed, the amount of which is limited by the amount of oxygen taken from the cells, *and the process of nature to excrete this substance from the system and to repair its effects we call the disease.*

If I understand Dr. Salmon correctly, during the time from the introduction of the virus to the development of the symptoms of the disease, the spores are developing, taking oxygen and giving out their ptomaine and propagating spores. After a certain number of cells have become affected we have external manifestations of the disease. Until this period arrives the germ is said to be incubating. The period of latency is, therefore, apparent, rather than real, and only indicates that sufficient poison has not yet been formed by the microbes to cause external symptoms.

Dr. Salmon's discovery claims that the inoculation of the product of the artificial development of the germ, *after* the subsequent destruction by heat of the microbes, enables him to protect the system of an animal from the disease, and that the action of the ptomaines is milder than that of the germs themselves, as the dose can be regulated. His experiments have so far been made with pigeons, with the microbe of hog cholera, and seem conclusive as to the protection given by a number of hypodermic injections of the ptomaine solution, but he does not, so far as I can ascertain, tell us if the discharges of these pigeons were capable of communicating the disease. Unless the specific ptomaine is capable of influencing unspecific germs to take on a pathogenic action, it does not seem possible that the poison of the disease can be increased in quantity. If the pigeons give out more of the ptomaine than was introduced into their bodies, unless we assume that it acts on innocent germs in such a manner as to make them pathogenic also, the theory falls to the ground, even though protection be given by the action of the ptomaine injections.

This theory is yet new; it seems to me of exceeding promise, but before it is fully accepted as an explanation of the phenomena, more extended experiments will have to be made. All that can be said of it at present is that it includes what seems proved to be true in the exhaustive theory of Pasteur, as well as in the ptomaine theory of Chauveau. As a valuable working hypothesis I give it, which may at no distant day become a firmly established theory, which will give us a deeper insight into contagion, together with all that that implies, viz., scientific methods of destroying the microbes in many, perhaps all, the diseases produced by specific microbic fermentation.

It would take too much space to recall the varied experiments made by Buist, Quist, and others, by which they have succeeded in propagating the microbes (and even the spores, it is claimed by the latter) of vaccinia and variola, and have thereby, to a certain extent, confirmed the earlier experiments of Ceely and Badcock, as to the identity of the viruses of these diseases, not only so far as the microscope can do so, but also so far as their cultivation in artificial media, fluid and solid, is concerned.

IDENTITY OF VIRUS OF SMALLPOX AND VACCINIA.

Robert Ceely thought that he had proved that he could inoculate a cow with smallpox, and produce a disease with a local vesicle, from which he could obtain virus; with this he tells us subsequently two thousand children were vaccinated without causing contagion in others. Chauveau and the Lyons Commission admit that he inoculated cows with the smallpox, but claim that the two thousand children were simply inoculated, and not vaccinated, and that the disease in them was contagious. It is a question of evidence: which is correct. Ceely is confirmed by Badcock's numerous experiments, and Chauveau is supported by Fleming, who, however, has no original experiments to offer, and is opposed in his conclusions by Professor Simmons, an equally reliable authority in veterinary matters. The Lyons Commission seems not to have been acquainted accurately with the English researches on this subject, and make many statements at direct variance with them on very slight proof. Ceely and Badcock found it *very difficult* to inoculate the cow; only about one out of thirty animals took. They obtained a well defined local vesicle, but no general eruption. Cows so inoculated failed to give the disease to others stalled with them. Badcock's experiments were made on over three hundred cows; Ceely's on a less number, but were carefully recorded and illustrated by colored plates from paintings taken on the spot. Badcock's virus has been used on over forty thousand persons, and Ceely's on a very large number, and both, after forty years, are still in use in England.

The French experimenters claim to have succeeded in *every* animal that they operated on, viz., twelve cows and three horses. The disease that they produced consisted in small vesicles scattered under the hair of the body around the seat of inoculation, and in their first five cases escaped recognition until subsequent experiments had taught them what to look for. They seem to have got no well marked vesicle at the point of inoculation, but rather an ill defined sore with small vesicles around it. With *matter* taken from this *sore* by scraping, they inoculated a number of children and produced a general eruption, which was contagious, and which caused the death of a child with the symptons of confluent smallpox.

Can we throw any light on this great difference in reported facts? We think recent researches help to explain, to some extent, this matter. First we may say that positive facts, from carefully conducted experiments on a sufficiently large number of animals, by competent experimenters, cannot be overthrown by simply negative evidence on a much smaller number. The disease observed by the French experimenters did not resemble in any respect the disease described by Ceely and Badcock, as well as by several continental experimenters, either in appearance, period of incubation, or in the nature of the virus produced. It may be remarked that the descriptions of Ceely are almost classical in clearness, while the account of the experiments reported by Chauveau are unsatisfactory on many important points. English authors claim, with some show of reason, that smallpox matter, in an advanced stage, was placed in cuts and caused sores, but failed to affect the system of the cow. Simmons states that he and Marson made many experiments, and failed in producing smallpox in the cow; he, therefore, does not believe that the French Commission could have so uniformly succeeded, as they claim to have done; and he denies that they produced the smallpox at all in the cows that they experimented on, but claims that they simply introduced the virus into cuts, and caused a local irritation, and subsequently removed and used this matter to inoculate children. That they blundered, and that fatally; that the general eruption observed was either caused by irritation, or was of the nature of eczema; and that the short period of incubation would favor this explanation.

BUIST'S RESEARCHES.

Buist has shown that spores of vaccine and variola microbes measure but .15 μ (micromillimeters), while the microbes are much larger, as seen in cultivations of the clear lymph in the form of white, yellow, orange, or brown vaccine, or in the cloudy virus in the mature vesicle. When he vaccinated a monkey with the clear virus containing the spores alone, he produced a local vesicle, well defined, with slight constitutional disturbance; but when he used the developed forms of the microbe, as found in the colored vaccines, he got secondary vesicles also on other parts of the body.

Jenner believed that in vaccination he produced smallpox, but that the disease, owing to the previous passage of the virus through the cow's system, had lost its virulence and contagiousness. This change Pasteur calls attenuation of the virus. Buist says that perfectly fresh, transparent virus contains spores alone, whether vaccine or variolous, and that opaque lymph is only a natural cultivation of the spores into microbes, and that while the clear lymph is alkaline, the cloudy is acid, and that the action of these two lymphs is very different—the clear, as we have already said, acting with little local or constitutional irritation, while the cloudy causes ulceration and secondary vesicles.

He believes the spores are able to reproduce themselves by bursting, while the microbe multiplies by division as well. When the spores are inoculated they remain for a time at the place of introduction without causing irritation, and are gradually taken up by the lymphatics probably, and in them it may be the greater number of spores become developed into microbes and affect the system. The beginning of local irritation he believes indicates the development of microbes on the skin and their propagation of spores, which in their subsequent development effects rapid changes in the tissues by the withdrawal of something from them, by imparting something to them, and thus altering their actions. He failed to propagate spores in solid media, though he gives credit to Quist for having succeeded in Koch's culture fluid. He believes that instead of trying to improve our stock of virus by energizing that already in use, we should rather endeavor to mitigate by artificial culture variolous virus, using only virus taken in the papular stage of the disease, before clouding has occurred. Both diseases he believes true fermentations. All fermentations he considers due to the development of spores into microbes, and to their propagation causing certain chemical changes, as the decomposition of sugar into alcohol and carbonic acid, which goes on until the sugar is used up, but may be started by a fresh supply; therefore, the microbes apparently are still alive, though dormant for a time. He finds that by inoculating dried yeast he can produce, after a certain time, a local sore, and he finds the yeast spore in the blood. In the monkey, vaccination did not fully protect it from smallpox inoculation, but after the additional yeast inoculation the protection was complete. By itself it modified the disease, though it did not prevent the entire formation of vesicles.

To return then to Ceely's experiments. He states that he used only perfectly limpid lymph in his inoculations of cows; Chauveau used the cloudy virus. It does not seem to me disproved by any experiment that has been recorded that cows cannot be so inoculated by smallpox virus as to have an eruption entirely different from the typical local vesicle obtained by Ceely. Indeed Buist's experiments would go to show that certain kinds of variola virus might produce a more general eruption than obtained by Ceely, Badcock, and others. If virus, at a late stage, containing microbes, not spores, be used, we should look for a general eruption. In the monkey neither the primary nor secondary vesicles caused the disease in other animals in the same cage. He does not, however, account for the well marked contagiousness of variolous inoculations in man, even when made with the virus taken perfectly clear from papules. He evidently believes that the cow's system attenuates the virus, and suggests its attenuation outside the body by suitable methods, as dilution (Salmon), or prolonged exposure to air (Pasteur). He, however, records no experiments on man; and, while his researches go to show how the Lyons Commission may have obtained a general eruption, they do not (as their object was different) prove conclusively the identity of the two viruses, though they tend to confirm what I at least consider as fully proved by evidence, the creditability of which I cannot doubt, and which has been so ably presented by Robert Ceely, viz., that cowpox is, in the cow as in man, only a modified smallpox, and that Jenner was perfectly accurate in speaking of the *vaccinæ variolæ*—the cow smallpox—and it is to be noted he refused to use any other name, apparently thinking that it might encourage the idea that vaccinia is an independent disease.

GENERAL CONCLUSIONS.

1. Vaccination is the artificial growth of a ferment on the skin, the products of which are absorbed and grow in the blood until the whole of the blood is affected, after which it is impossible, for a time at least, to repeat the process in the same person, who is then said to be protected. (Buist.)

2. The cause of this fermentation is due to the development of a microbe closely allied in all probability to yeast. This microbe is found in various stages of growth—as a spore, when the virus both in and out of the body is alkaline; in more mature forms, as found in the white or cloudy virus, seen after the areola forms or in old stored virus, and also in cultivations in solid media when the reaction is acid. We find varied forms or stages of growth of the microbe, which are indicated by characteristic colors, and which are able to reproduce themselves. These are, as named from their color, white, yellow, orange, and brown.

3. This microbe inoculated as a spore multiplies on the skin and in the

interior of the body, and develops into more mature forms. In doing this it takes free oxygen from the cells, and without it, it cannot develop. The interior of the body has been proved to contain little oxygen in the free state and the protoplasm of the cells to require but a scant supply. If the spores are more active than the cells, they absorb oxygen and excrete a ptomaine which paralyzes, so to speak, the functions of the cells. A ptomaine has been produced in the case of hog cholera outside of the body by the culture of the specific microbe in a suitable medium and its subsequent destruction by heat. Such a solution produces the disease when injected under the skin. The spores exhausting the oxygen of the cells in their development are rendered dormant or destroyed, and this terminates the disease. (Salmon.)

4. The microbe of smallpox and vaccinia are the same. This is proved by the inoculations of cows by Ceely and Badcock, and their conclusions are not in my opinion disproved by the experiments of Chauveau, and the arguments of Fleming and others. Though the microbe is the same in these two diseases, it is rendered probable by the experiments of Buist that their stage of growth is different. It will be remembered that he made cultivations from different vaccine vesicles and obtained four if not five kinds of virus characterized by their colors, viz., white, yellow, orange, and brown, besides the opaque found in the late vesicles. He also found that any one of the first four would produce a general eruption but no local vesicle, but if all four were inoculated a vesicle was also formed. He obtained similar colored viruses from variola. A single cultivation of the clear variola virus, taken early from papules, caused a modified action, as shown when inoculated on a monkey, while a second cultivation rendered its action still lighter and the monkeys both failed to give the disease by infection.

5. The only suitable material for vaccination is that containing spores alone, and not other developmental stages of growth of the microbe. Spores produce a typical vesicle, and no general eruption. Microbes in all their other stages cause great local irritation and often a general eruption. To this cause, doubtless, may be attributed the not uncommon eruptions that were found to follow vaccination with certain animal viruses during the recent prevalence of smallpox in this State.

6. All authorities are agreed that arm-to-arm or calf-to-arm vaccination is that most certain to produce typical vesicles in the greatest proportion of cases, and without undue local irritation or general eruption. Of all stored lymph, that preserved by drying *thoroughly* and *quickly* keeps best and preserves the spores in the spore state, but it requires special skill in using to remove the virus from the points, and to introduce it into the skin.

RULES FOR THE USE OF ANIMAL VIRUS.

The following rules are the result of the most recent research, and may, perhaps, be found convenient to the reader:

1. Only vaccinate those free from fever or skin eruptions, except when absolutely necessary.
2. Cleanse the arm with soap and water and rub until red.
3. Moisten the point in lukewarm water or glycerine and water, and mix the virus on it with the moisture with another point.
4. Apply the virus to the part to be vaccinated, and scratch the skin through it with the point or with a needle, or abrade the skin first with the sharp sides of the point, and then apply the virus. In either case, it is better to make two vaccinations at a distance of an inch and a half from

each other, and each at least one quarter of an inch square. The virus must be *rubbed* in well. *Whatever instrument is used it should never be used for another case.*

5. See that the vesicle is not injured. Apply, if necessary, jewelers' cotton and a bandage over it, if there is any danger of exposure to infection, dust, or cold.

6. See cases in one week; give only provisional certificates until results are known with certainty.

7. Keep animal virus dry and cool. The temperature should be steady and not over 60 degrees. This may generally be done by wrapping in gutta percha tissue, and putting in a wide-mouthed jar, in which is a small uncorked wide-mouthed bottle containing unslacked lime, closing securely the jar and keeping it in the cellar. Virus will often become inactive in a few hours if exposed to moisture together with sudden changes of temperature.

8. Virus apparently inactive will often become active if wet with glycerine and water, and the virus well mixed with it and allowed to stand under cover for several hours in a warm room before using.

9. Examine all points after using by pouring water over them to see that the virus is all removed.

10. Lastly, take plenty of time, use enough virus, and be sure that it is well rubbed in, and the scarification dry before you dismiss the patient.

NOTE.—Animal virus that produces in any considerable proportion of cases local ulcerations, much fever, and secondary eruptions, if free from septic material, is a virus containing the mature forms of the microbe, and not the spores alone. It is usually propagated by large abrasions in adult animals, which give an enormous yield of liquor sanguinis, with microbes in different stages of development in it, and frequently pus and the results of inflammatory action also. It is very active locally and constitutionally, but is not a pure virus. It is responsible for many of the accidents that sometimes attend this operation. All authorities are agreed that pure animal virus, *i. e.*, virus containing spores alone, acts with little irritation, and that its course is slower than long humanized virus. Virus is never to be judged by the violence of its action, either locally or constitutionally, but rather by its action conforming to a Jennerian type.

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FLEMING, GEORGE—"Human and Animal Variolæ, a study in Comparative Pathology." London "Lancet" for 1880. Also revised and printed in 1881 in book form by Bailliere, Tindall & Cox, London. These articles are numerous, but contain no original experiments, and are chiefly valuable for a strong partisan presentation of the side of the dualists. I have relied on them principally for an account of Chauveau's experiments. They have tended to confirm my belief in the accuracy of Ceely's experiments, not to weaken it. To show that equally high veterinary authorities hold opposite opinions, I quote from the remarks of Professor Simmonds, of the Royal Veterinary College, as given in the "Lancet" of January 3, 1880: "He ridiculed the idea of Ceely and Badcock's experiments in successful variolisation of cows, and consequent production of vaccines being disputed. He himself in conjunction with the late Mr. Marson, had been one of the largest unsuccessful experimenters on the variolisation of cows, but his failures had not led him to doubt Ceely's and Badcock's successful experiments, with full knowledge of the evidence regarding them. Mr. Marson's skill had prevented him from perpetrating the blunders into which Chauveau fell, blunders arising in a great measure from ignorance of what had already been done in England on the subject."

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FIRST ANNUAL REPORT OF THE PACIFIC COAST VACCINE STATION.

This vaccine station was begun November 1, 1887, under the following circumstances: Having in my practice in California since 1869 experienced much difficulty in procuring animal virus that was both active and unirritating, I was led, as early as 1876, to make experimental inoculations of calves, and used the virus thus obtained in my practice with success. At this time I did not go further. A few years ago I vaccinated one of my children with animal virus obtained from a prominent druggist in San Francisco. This produced a large vesicle as early, I think, as the sixth day, followed by an extensive areola later. The vesicle, which was irregular in shape, ruptured, and a deep ulceration followed, extending to a depth of over half an inch and some two inches in diameter. The areola merged into a diffuse erythema, extending over the whole arm and forearm, and was accompanied by vomiting and high fever. The child was seriously sick for some two weeks, and the course of the disease was such as to make it a matter of doubt if she was protected. Subsequent vaccination showed that she was not fully protected.

Having since then had several similar cases with virus that I had supposed to be reliable, and having failed in over two thirds of primary cases in producing any effect with virus procured direct from reliable propagators in the East, by mail, my attention was directed to its local production. But upon making inquiries of the wholesale druggists in San Francisco I found the demand was irregular and limited, and the competition between various eastern viruses so great that there was little likelihood of obtaining sufficient from its sale to pay the necessary expenses of its propagation, without it was used largely by the various Health Boards of the State, as well as by the Quarantine Officer of San Francisco.

Here the matter again rested for some two years, when my attention was again called to this subject by inactive virus on one hand and by the results following the use of irritating virus on the other. Between these dates I had devoted more or less attention to this subject. I finally made up my mind to try the experiment of propagating virus in California, having exceptional facilities for obtaining healthy calves of a proper age and in caring for them economically, thus producing the virus at the least possible cost. I accordingly made a series of experiments on calves and cows with a number of eastern viruses, corresponded with several experts on the technique of its production, and obtained careful reports of the methods followed by the most reliable establishments, from physicians, who, at my expense, visited them so far as they were open to inspection. I also obtained minute directions from the veterinary surgeon employed by the New York Health Board for examining calves previous to vaccination. After repeatedly testing various viruses on calves, and the resulting virus on children, I selected the viruses propagated by Dr. F. G. Foster and by the New York Health Board as "stock."

About this time, and before the necessary buildings were completed, a sudden demand was made upon us for a large supply of virus, owing to the rapid increase of smallpox in the State. Having only some five thousand uncharged ivory points on hand, and the demand being urgent, Mr. James G. Sheppard, pharmaceutist, of San Rafael, and who had kindly offered to take charge of the business of packing and dispensing the virus, agreed to recoat used points for the San Francisco Board of Health, supplying one thousand a day, by special messenger, on the same day that the virus was taken, and, of course, without any testing of the virus on children (before issuing), at 6 cents a point—this being the exact cost of production, without any charge being made for the use of the "plant," or for the services of Mr. Sheppard and myself. The Board, Mr. Sheppard understood, promised a fair trial of these points in primary cases, and they were so packed that we could at once tell, by a number, from which calf any virus had come. Samples were also sent to physicians, requesting trial and reports, and a large number sold to physicians, druggists, and others.

The tests we made (subsequent to its issue) with this virus on children, as well as on calves, showed a good proportion of well developed vesicles, without any undue local or constitutional irritation, but there were a number of cases of raspberry excrescence, an irregularity very common in New York at the time our "stock viruses" were sent us, and which Dr. F. G. Foster states was peculiar to no one virus there. Revaccination showed that when accompanied by a well defined areola, that these protected, otherwise not. On this account, we substituted the Martin virus for one of the above, and since have not observed a single case of this irregularity in any subsequent testing. This virus was, after taking, dried over sulphuric acid (free from chlorine and nitric acid) before issuing. The coating was nearly colorless, and was very dry and hard.

The reports received as to the action of this virus have not been numerous, and indicate that in the hands of some physicians it produced a high percentage of typical vesicles, while in the hands of others it failed in every case, and this frequently with virus from the same calf. No report has been received by us from the Health Board of San Francisco. Statements have, however, been made in the daily papers that out of three hundred points all had failed. Dr. Anderson, one of their vaccinators, informed me that he had reported three hundred and nine successes out of four hundred points issued to him for the purpose of testing the virus, in primary and secondary cases.

The object we had in view in furnishing the virus to this Board at the actual cost of production, without asking anything for our own labor, was, of course, that it might be carefully tested. We received a request after the last delivery for the bill for the virus furnished, and a few days later an official communication that payment was refused, as the virus was unsatisfactory. Dr. Herrick has since published the reports of four vaccinators with it, and Dr. DeWitt, another vaccinator, personally informed me that he had used one hundred points issued to him in vaccinating a school, but as they had been mixed with those of another propagator, he could not say whether they had taken or not. Dr. Osborne, of the Home for Feeble-Minded Children, Dr. Durant, of the State Prison at San Quentin, besides a number of private physicians, have reported gratifying success.

We cannot help thinking that the San Francisco Board of Health obtained our virus under a misrepresentation, and that they failed to test it in primary cases as promised. Since this unfortunate experience we have issued virus dried more slowly, and coated to keep it from the air, and have had few complaints of its action, but we do not regard it as as well adapted for keeping as that at first issued, which we still use to send to a distance. To obtain energetic local and constitutional action (which we do not consider desirable) with either virus, all that is necessary is that the points shall be exposed to moisture and a heat of 90 degrees Fahrenheit for a few hours, when a sufficient number of microbes will develop from the spores to produce sufficient irritation to satisfy even this Board of its activity. This, however, is the exact object that every conscientious propagator uses every measure to avoid.

From the above it will be seen that we attribute the failures that have occurred in the use of this virus to the dryness of the coating of virus on the ivory points, and the consequent difficulty in its removal. That this difficulty was experienced though not apparently recognized with other viruses is plain, at least so far as the San Francisco Health Board is concerned, from the fact that out of fourteen thousand used points furnished us for recoating, about eight thousand had a decided coating on still, even after three washings and bleaching.

If our object had been simply to manufacture virus that would produce sore arms and fever, which the public prints of San Francisco stated—apparently by authority—were the signs following the proper taking of vaccine virus, we should undoubtedly have had fewer complaints and larger receipts from sales.

As our object was to propagate *spore virus* free from microbes as well as blood and all septic matter—"*pure spore virus*"—we must be content to wait until the knowledge on this subject has increased with the profession as well as with the public, before we can expect to be remunerated for our expenditure. Meanwhile, it is evidently a proper business precaution, and one necessitated by our past experience, to only issue virus already paid for.

One other observation, and I have done with this unpleasant portion of my report. Careful testing subsequent to issue of the virus first propagated showed that the virus of two, if not more, calves failed to take, and unfortunately for us, much of this had been sent out as samples. We therefore issued a circular, and refunded all money paid for this virus or replaced it by fresh stock. We were sorry, however, to receive a demand from a physician connected with a public institution for the refunding of money for virus never bought of us.

What have we done so far? We have secured some forty acres of pasture; have put up proper stables and operating rooms; have vaccinated one hundred and three calves and cows; and have coated twenty-five thousand points. We have spent $2,500 and only received about $1,500 for virus sold. If suit against the San Francisco Board of Health results in our favor, this will be increased by nearly $300. The average number of points taken from a calf has been about two hundred and fifty to three hundred, and the cost to us of each point has been 6 cents, without including any compensation for our services. We have made diligent search for cases of cowpox throughout the State, and have investigated six cases; have distributed one thousand two hundred descriptions of the disease, offering a reward of $25 for cases. So far, all have proved to be cases of "whitepox," but we are still continuing our inquiries, and hope in time to succeed. We have collected a small library, containing some rare books on vaccination. It would be impossible to make intelligible, without numerous colored plates, the technical methods employed, even if space would permit. We may say in brief, however, that we prefer calves about a year old, in good health, but not fat. That the temperature of these should be taken in the rectum, and should not show changes during the day. This temperature seems higher here than in the East, frequently being 101.5 degrees, and even higher in calves healthy in all respects. If there is no increase of temperature at night, and the animal is free from diarrhœa and glandular swellings, I believe it safe to disregard the temperature if lower than 102 degrees, Fahrenheit, if it is uniform. The calf, which before using is best kept at pasture, is, after vaccination, put in a clean stall, bedded with fresh straw twice daily. It should have a pail of water to drink from, and should be fed with a good quality of hay, with two small feeds of bran with a little oil cake. Its temperature should be marked on its tag daily, and it should wear around its neck a light collar of wooden slats, to prevent it licking its abdomen. The method of inoculation that we prefer is by single incisions, producing simple vesicles. This plan is used by Warlomont, in the Belgium Vaccine Institute, with great success. Abrasions on the abdomen made by a blunt instrument is the plan used by Foster, while Pardoe, of the New York Health Board, uses a six-bladed lancet, and makes larger scarifications on the flanks and sides of adult animals. There is another method only in use by "the trade." I believe, it consists, like the last, in scarifications on the flanks of adult animals, but differs from it in the size and number of these and in the operators being uneducated. It is of this that Martin speaks in the quotation already given. These yield an enormous amount of serum, and it is said as high as twenty thousand to twenty-five thousand points have been coated from one animal.

An appreciation of these several methods leads us to the following conclusions, which further experience may perhaps modify. The method of small single incisions, which we use, is troublesome and yields a limited supply of very thick virus, which frequently requires much skill and a peculiar technique to remove free of blood. On the other hand, it produces on the calf operated on, typical vesicles, and the virus contains spores only. In my hands it has yielded from fifty to five hundred points—the average being, I think, about three hundred. It is in use in this country by Dr. Martin, whose father was the first to propagate animal virus in the United States.

By the second method a compound vesicle, or series of vesicles, under a crust, are formed, not so easy of recognition as in the former method. The yield of serum is larger, however. In the third method the yield is still greater, one thousand to three thousand points, but the vesicles are by no means well formed, and virus thus taken should always be tested on children before being issued. It cannot compare with either of the other methods, except as to yield. In skillful hands it is capable of furnishing spore virus, but there is constant danger of the virus containing microbes. The commercial method, which is simply this exaggerated, furnishes most of the irritating virus in use in the West. Its only recommendation is the cheapness of its product. A large profit can be made by selling points thus produced on Texas cattle, at one half of a cent each; accordingly large discounts can be given, and a division of profits can be made with those in public positions, and yet enough remain to make the propagation very profitable. Virus produced by the method used by us cannot, I think, be produced much under 6 cents a point, allowing only for actual cost. It therefore cannot compete, as far as price is concerned, with that produced by any of the other methods.

The objections to all virus taken from large scarifications is that the vesicles are not well defined. The flow of serum is large, but the exact stage of growth of the spore cannot be ascertained readily. Consequently virus containing microbes, and consequently producing irritating constitutional as well as local effects, will often be issued. With regard to the activity and keeping qualities of our virus, Dr. Winslow Anderson writes me that he has obtained a "beautiful vesicle" from a point fifty days old, kept most of the time in his office. I have also obtained typical vesicles in virus fifty-eight, ninety, and one hundred and fifty days old.

In concluding this report, I would ask if it is desirable that a vaccine station should exist on this coast, and if so if it shall supply the very best virus without regard to cost, or the best virus " for the money." There is only one way to give confidence to the public in the first named or germ virus and at the same time to be certain that it only is issued. In my opinion the vaccine station should be owned by the State, or else under its supervision. If in private hands its product should be tested and its processes inspected. In return its virus should alone be used by the State, who should have a direct interest in its success. So far, as we have already said, we have made virus that is active, keeps well as far as tested, and produces little local or constitutional irritation, but in doing this we have lost $1,000 on twenty-five thousand points sold. As this is about the cost of our " plant," which we still have on hand, it perhaps should not be all charged as lost. Against this, however, several months' constant attention of Mr. Sheppard and myself is to be charged, as every point has been taken and packed under the immediate supervision of one or the other of us.

VITAL STATISTICS, AND THE TRUE COEFFICIENT OF MORTALITY, ILLUSTRATED BY CANCER.

By John Le Conte.

Mankind, when studied in numbers sufficiently large to eliminate accidental and individual peculiarities, possess certain *common qualities or properties*, which vary according to *determinable laws*. For example, the ratio of the sexes at birth, their relative weight at the same epoch, their gradual growth until the period of maturity, their attainment of a certain mean age, and their liability to death from various causes, are found to observe *fixed laws;* they are always the same under the same circumstances. It is the enumeration, systematization, and generalization of these facts that constitute what has been happily designated by the illustrious Laplace.

VITAL STATISTICS.

Until comparatively recent times, physicians do not appear to have sufficiently appreciated and employed the valuable instrument of statistical calculation. It is probably, only by the assistance of such an exact test, that we shall eventually arrive at fixed conclusions respecting the efficacy of different modes of treating disease, and the prognosis to be formed regarding the probable issue of various maladies. In the history of the more demonstrative sciences, it will be found that it is the introduction and use of *accurate numerical measures* that forms the prelude to the epoch of rapid advancement. The theory of gravitation in astronomy, that of definite proportions in chemistry, and that of luminiferous undulations in optics, are all *numerical* theories, susceptible of mathematical expression. There is, of course, no *absolute certainty* beyond the pale of pure mathematics, as probabilities pertain even to the most perfect of the mixed mathematical sciences; nevertheless, the extent to which any science admits of the application of numbers may be regarded as a fair measure of its *exactness*.

In respect of a single individual, or a small number of persons, the uncertainty of the duration of life is proverbial. But the case is entirely changed when *multitudes* are concerned; and there are few classes of contingent events of which the results can be predicted with so little risk of departure from the truth, as the average age to which the lives of a considerable number of persons will be prolonged. Various as are the causes operating in the production of disease, it is now demonstrated that mortality is subject to a *law*, the operation of which is scarcely less regular and certain than that of gravitation. Deaths and their causes are scientific facts, admitting of mathematical analysis, and medicine, like other natural sciences, is beginning to substitute numerical expressions for crude hypotheses and vague conjectures. Our existing means of observation, and the present state of mathematical analysis, are still too imperfect to enable us to trace the elements of the human body through the cycle of organization, but these same obstacles are encountered even when dealing with the inorganic atoms of chemistry and the multifarious phenomena of meteorology.

In this, as in all genuine sciences, our knowledge becomes real and scientific only in so far as it is *verified* in particular facts, and thus established in *general propositions*.

Of late years such advances have been made in the science of pathology, and the systems of registrations have been so much improved, that we may reasonably hope, before long, to secure results of the most interesting and useful import to the medical philosopher. Indeed, on many important points valuable deductions have already been drawn from the discussions of statistics of mortality. But it appears to me that in discussing the *available statistical data*, medical writers *have failed to obtain from them the true value of the facts contained in the numbers*. It is to *this aspect of the subject* that I desire to direct the attention of the medical profession of this country. The *specific point* to which attention is drawn *is the necessity of estimating the relative tendency to special diseases, by comparing the mortality with the number of persons living*.

In comparing the general mortality of different countries and cities, this method is usually adopted, and most valuable results have thus been secured. But when the *relative mortality from different diseases* is discussed, it is usual to make the *total mortality* the basis of comparison. Such estimates may give rise to the most *erroneous* conclusions. For example, in London, during the last century, the total mortality has decreased from one in twenty to one in forty of the entire population at the two extreme periods. Hence, assuming the number of deaths from some special disease to the number *living* to have been *constant* during this time, the proportional results deduced from a comparison of the total mortality at the end of the century with the number dying from this particular disease at the same epoch, would apparently indicate a *duplication* of the mortality from this disease in one hundred years; when, in fact, there had been no *real* alteration.

In like manner in discussing the influence of *age* on the mortality from any given disease, it is very common to prepare tables of the number of deaths at each age; and, in some instances, these numbers have been assumed to represent the *relative tendency* to the disease at different ages. This is a very serious error; for it must be borne in mind that the number of persons *living* at different ages is very far from being *equal*.

Writers on "Vital Statistics" need to be reminded in relation to the correct method of discussing the mortuary data. As already indicated, the specific point to which attention is drawn is the necessity of estimating the relative mortality from special diseases by comparing the number of deaths from the given cause with the number of persons living at the ages embraced in the record; instead of making the comparison (as is usually done) with the total deaths from all causes, or with the total number of persons living at all ages.

Indeed, it is so self-evident—so axiomatic—that the true *coefficient of mortality* from any given disease, is expressed by the *ratio* of the number of persons *dying* from the specified disease at the given age, to the number of persons *living* at the same age, that it seems most extraordinary that those medical men whose function it is to discuss mortuary statistics, have, in a great measure, neglected to make this ratio the basis of the comparative mortality from different diseases in different countries and in different cities.

Even in estimating the *general mortality* by comparing the total annual deaths with the number of persons living at all ages, *misleading results* may be deduced from such figures. Thus, the apparent *low* general mortality of San Francisco, as compared with several eastern cities, is, without doubt, due to the *abnormal* condition of its population; to the larger proportion of *adults* as compared with *children;* for the mortality among adults is always low as compared with children. Hence, the general mortality in relation to the whole population comes out *abnormally low.* It will be seen hereafter that this result so flattering to our self-sufficiency is by no means sustained by the application of more correct methods of comparison. Moreover, when *age* comes in as an important element in the mortality from specific diseases, as estimated by the number of deaths from the given disease, compared with either the total number of deaths or with the total number of persons living at all ages, the seriously misleading character of the figures thus deduced becomes truly appalling, especially when the population has not attained its normal condition. But, under no circumstances, do the ratios thus obtained express the true *coefficient of mortality* from the given disease or the relative tendency of such disease to destroy human life.

To illustrate this point, let us take *Cholera Infantum.* How erroneous and misleading it would be to estimate the relative mortality from this disease in the city of San Francisco, as compared with that in eastern cities, by the ratio of the deaths from this disease, either to the total deaths, or to the total population of the cities respectively compared. It is obvious that the true coefficient of mortality for cholera infantum, in any case (whether the population is normal or abnormal), is expressed by the *ratio of the number of deaths from this disease to the number of persons liable to be attacked by it.* In the foregoing example this would be indicated (sensibly) by the ratio of the number of deaths from cholera infantum to the number of children living under three years of age. This is an *extreme case*, but it furnishes a *glaring instance* of the *fallacy* of estimating the relative mortality from infantile diseases in different countries or cities, from the ratio of the number of annual deaths from such diseases to the total deaths from all causes, or to the total population living at all ages. But in all cases the ratio of the number of deaths at any age to the number of persons living at that age furnishes a correct expression for the relative mortality at the given age—that is the *real coefficient* of mortality, independently of the distribution of population at different ages.

These considerations are so self-evident, that there must be some reason why mortuary statistics have not universally been discussed from this point of view, instead of the fallacious and misleading one which has been indicated. In reply to letters of inquiry in relation to this point, I have been informed that it is impossible to obtain the statistics of the number of persons living at each age or period of life. But, it seems to me that this difficulty is greatly exaggerated—that it is by no means insuperable, and should not interfere with the application of the correct method to our mortuary records. This will be apparent from the following considerations:

1. The national census, which is taken every *ten years*, should furnish trustworthy estimates for that year of the number of persons living and dying at each age, or, at any rate, of the number living and dying at each quinquennial or decennial period of life. And the successive censuses give us the *rate of increase* of population at each period of life; so that the number of persons living at each period of life during the years intervening between the censuses may be *estimated* with sufficient approximation to accuracy for the purposes under consideration, while the annual death records will furnish the mortuary data.

2. The school census, which is taken every year, furnishes a trustworthy enumeration of the youths living at each age, from birth to seventeen years of age; and this is precisely the period of life in which the increase

of population is most uncertain, and, consequently, the estimates, based upon the successive national censuses, are liable to be most inaccurate. For *adults*, the data furnished by the United States census are sufficiently accurate to enable us to estimate for each intervening year the number of persons living at each age.

It thus appears to be evident that the vital and mortuary statistical data required for computing the true coefficient of mortality for each disease at each age can be obtained with sufficient accuracy for making the comparisons for different countries and cities alike trustworthy and instructive. The only real obstacle in the execution of the project is the persistent attention, care, time, and labor required in the performance of the arithmetical operations for deducing the numerical ratios. This is, indeed, a most serious difficulty; but I am quite sure that there are those to be found in the ranks of the medical profession who possess that combination of intelligence, leisure, and tenacity of purpose requisite for undertaking such an arduous task. One thing is absolutely certain, viz.: That the rich and precious mortuary data, which for many years have been accumulating, must remain comparatively barren in instructive deductions until this gigantic statistical labor is performed.

GENERAL MORTALITY FROM ALL CAUSES AT DIFFERENT AGES.

As a slight foretaste of the character and results of such statistical work, I herewith submit to the consideration of the reader the numerical data collected in Table I, relating to the United States and to twenty-four of the States. The numerical data in the columns headed "Living in 1870," and "Deaths in 1870," are taken from the "Federal Census" for the year 1870. The deduced numbers in the successive columns headed "Deaths in One Thousand Living" are obtained by dividing one thousand times the number of deaths at the giving period of life by the number living at the corresponding period; in other terms, the numbers in these columns are equal to one thousand times the *mean coefficient* of mortality from all causes at the given period of life. In early life, the mortality decreases so rapidly and so *irregularly* with increasing age, that the *quinquennial* interval is too large to secure accurate mean coefficients from birth to five years of age; but the error is comparatively slight, and does not influence *relative* proportions. Of course, the *shorter* the vital and mortuary intervals, the more accurate would be the deduced coefficients; and, for scientific purposes, it would be desirable to have the interval as small as *one* year. The census furnished the data for intervals from one to two, two to three, three to four, and four to five years of age; but it is not deemed important or necessary to make this amplification of the table. And for similar reasons, the computations have not been extended beyond the age of thirty years. I have restricted my statistical researches to the *white* population, for the obvious reason that the data in the census in relation to the *colored* population are notoriously untrustworthy.

TABLE 1.

White Population—Census for 1870.

STATES.	AT ALL AGES.			FROM 0 TO 1 YEARS.			FROM 0 TO 5 YEARS.			FROM 5 TO 10 YEARS.		
	Living in 1870.	Deaths in 1870.	Deaths in 1,000 Living.	Living in 1870.	Deaths in 1870.	Deaths in 1,000 Living.	Living in 1870.	Deaths in 1870.	Deaths in 1,000 Living.	Living in 1870.	Deaths in 1870.	Deaths in 1,000 Living.
United States	33,589,377	424,140	12.63	947,309	94,555	99.81	4,719,792	187,636	39.76	4,151,715	22,178	5.34
1. Alabama	521,384	4,737	9.09	15,055	723	48.02	77,249	1,461	18.87	66,168	255	3.85
2. California	499,424	8,427	16.87	13,317	1,788	134.26	66,742	3,382	50.67	60,189	562	9.34
3. Connecticut	527,549	6,670	12.64	11,794	1,101	93.35	57,615	1,895	32.89	52,130	273	5.24
4. Georgia	638,926	6,368	9.97	18,993	1,264	66.55	96,530	2,285	23.67	79,678	343	4.30
5. Illinois	2,511,096	33,342	13.28	78,442	9,150	116.65	386,486	16,808	43.49	336,435	2,121	6.30
6. Indiana	1,655,837	17,320	10.46	50,271	3,818	75.95	249,699	7,151	28.64	226,346	958	4.23
7. Kentucky	1,098,692	11,311	10.30	34,976	2,842	81.26	172,352	4,624	26.83	152,687	501	3.28
8. Louisiana	362,065	7,593	20.97	10,885	1,732	159.12	53,022	2,830	53.37	45,010	369	8.18
9. Maryland	605,497	7,446	12.30	16,941	1,576	93.03	83,052	3,140	37.81	74,714	389	5.21
10. Massachusetts	1,443,156	25,487	17.66	32,673	5,178	158.48	155,460	9,068	58.33	138,706	980	7.07
11. Michigan	1,167,282	10,910	9.35	32,168	2,507	77.93	161,910	4,458	27.53	143,849	585	4.07
12. Mississippi	382,896	3,712	9.70	12,051	672	55.76	59,574	1,264	21.22	47,190	222	4.70
13. Missouri	1,603,146	26,256	16.38	51,221	6,669	130.20	258,378	12,878	49.84	222,593	1,669	7.50
14. New Hampshire	317,697	4,281	13.48	5,731	486	84.80	29,622	931	31.43	28,171	142	5.04
15. New Jersey	875,407	10,139	11.58	24,083	2,389	99.20	115,869	4,504	38.87	102,566	560	5.46
16. New York	4,330,210	67,709	15.64	102,815	15,260	148.42	515,339	27,601	53.56	478,673	2,939	6.14
17. North Carolina	678,470	6,087	8.97	18,466	1,068	57.84	97,807	1,930	19.73	83,531	252	3.02
18. Ohio	2,601,946	28,494	10.95	73,787	6,361	86.21	366,540	11,314	30.87	328,912	1,220	3.71
19. Pennsylvania	3,456,609	50,973	14.75	97,679	11,858	121.40	484,736	22,421	46.25	425,529	2,977	7.00
20. South Carolina	289,667	2,445	8.44	7,693	382	49.66	41,158	730	17.74	34,715	132	3.80
21. Tennessee	936,119	9,778	10.45	29,173	2,188	75.00	147,320	3,733	25.34	123,409	441	3.57
22. Vermont	329,613	3,537	10.73	7,104	529	74.47	37,251	919	24.67	34,369	143	4.16
23. Virginia	712,089	7,532	10.58	20,043	1,647	82.17	100,956	2,803	27.76	83,701	280	3.35
24. Wisconsin	1,051,351	9,914	9.43	30,940	2,210	71.43	156,648	4,415	28.19	145,522	651	4.47

TABLE I—Continued.

STATES.	FROM 10 TO 15 YEARS.			FROM 15 TO 20 YEARS.			FROM 20 TO 25 YEARS.			FROM 25 TO 30 YEARS.		
	Living in 1870.	Deaths in 1870.	Deaths in 1,000 Living.	Living in 1870.	Deaths in 1870.	Deaths in 1,000 Living.	Living in 1870.	Deaths in 1870.	Deaths in 1,000 Living.	Living in 1870.	Deaths in 1870.	Deaths in 1,000 Living.
United States	4,136,461	12,815	3.10	3,511,036	16,402	4.67	3,235,028	21,465	6.64	2,681,552	19,283	7.19
1. Alabama	76,361	237	3.10	64,407	269	4.18	56,335	321	5.69	37,692	243	6.45
2. California	49,523	221	4.46	33,976	217	6.39	39,584	316	7.98	46,871	428	9.13
3. Connecticut	54,133	201	3.71	50,313	233	4.63	49,471	355	7.18	44,649	323	7.23
4. Georgia	91,489	284	3.10	76,992	329	4.27	68,745	370	5.38	45,865	286	5.58
5. Illinois	318,948	1,088	3.41	257,958	1,231	4.77	238,336	1,469	6.16	203,179	1,382	6.80
6. Indiana	220,420	569	2.58	184,820	823	4.45	156,897	985	6.28	125,537	811	6.46
7. Kentucky	147,302	417	2.83	122,175	510	4.17	107,352	677	6.31	81,490	526	6.45
8. Louisiana	48,276	241	4.99	39,935	275	6.89	35,032	395	11.28	28,168	421	14.95
9. Maryland	73,904	212	2.87	65,051	256	3.94	55,967	319	5.70	47,444	300	6.32
10. Massachusetts	147,149	591	4.02	140,636	953	6.78	142,556	1,354	9.50	128,756	1,327	10.31
11. Michigan	138,428	367	2.65	117,502	484	4.12	93,667	575	6.14	100,035	510	5.10
12. Mississippi	53,646	145	2.70	46,524	211	4.54	42,354	262	6.19	28,962	187	6.46
13. Missouri	210,479	853	4.05	167,256	1,028	6.15	155,285	1,313	8.46	130,009	1,128	8.58
14. New Hampshire	31,808	97	3.05	31,479	193	6.13	29,235	262	8.96	24,448	185	7.57
15. New Jersey	100,344	231	2.30	85,276	289	3.39	80,647	412	5.11	73,794	388	5.26
16. New York	478,639	1,494	3.12	428,552	2,052	4.79	408,680	3,113	7.62	361,669	3,091	8.75
17. North Carolina	92,349	214	2.32	78,441	300	3.82	70,216	350	4.98	46,296	234	5.05
18. Ohio	326,746	734	2.25	281,482	1,124	3.17	247,603	1,448	5.85	201,006	1,350	6.72
19. Pennsylvania	415,580	1,409	3.39	361,231	1,582	4.38	330,220	2,192	6.64	278,948	2,110	7.56
20. South Carolina	39,223	101	2.58	33,473	117	3.50	30,682	117	3.81	21,004	108	5.14
21. Tennessee	128,075	349	2.72	107,449	505	4.70	96,918	653	6.74	69,016	536	7.77
22. Vermont	34,854	99	2.84	33,587	148	4.41	29,327	169	5.76	24,845	153	6.16
23. Virginia	93,060	197	2.12	79,093	276	3.49	70,820	360	5.08	51,493	319	6.20
24. Wisconsin	139,610	387	2.77	110,162	412	3.74	87,029	414	4.76	70,234	351	5.00

In Table II, the computed results contained in Table I are segregated, and the States are arranged in the order of increasing magnitude of the death rate per one thousand living between birth and five years of age. The results indicated in this table are somewhat unexpected and surprising; but they are nevertheless quite significant. The order of States strikingly exhibits the fact that *density of population*, or *urban life*, is the controlling element in determining the magnitude of the coefficient of mortality among children under five years of age. Those States having the greatest number of populous cities and towns have the *highest death rate*, and stand *lowest* on the list. The position of Vermont (No. 6) clearly shows that the severity of winter climate is quite subordinate to other mortuary influences. A glance at the numbers in the column headed "0 to 1 year," reveals nearly the same order for the magnitude of the death rate for infants under one year of age, as for children under five years of age.

TABLE II.

Deaths in 1870, per One Thousand Living at Quinquennial Periods of Life.

States arranged in order of increasing magnitude of death-rate between birth and 5 years of age, or 0 to 5 years.

STATES.	All Ages.	0 to 1 Years.	0 to 5 Years.	5 to 10 Years.	10 to 15 Years.	15 to 20 Years.	20 to 25 Years.	25 to 30 Years.
United States	12.63	99.81	39.76	5.34	3.10	4.67	6.64	7.19
1. South Carolina	8.44	49.66	17.74	3.80	2.58	3.50	3.81	5.14
2. Alabama	9.08	48.02	18.87	3.85	3.10	4.18	5.69	6.45
3. North Carolina	8.97	57.84	19.73	3.02	2.32	3.82	4.98	5.05
4. Mississippi	9.70	55.76	21.22	4.70	2.70	4.54	6.19	6.46
5. Georgia	9.97	66.55	23.67	4.30	3.10	4.27	5.38	5.58
6. Vermont	10.73	74.47	24.67	4.16	2.84	4.41	5.76	6.16
7. Tennessee	10.45	75.00	25.34	3.57	2.72	4.70	6.74	7.77
8. Kentucky	10.30	81.26	26.83	3.28	2.83	4.17	6.31	6.45
9. Michigan	9.35	77.93	27.53	4.07	2.65	4.12	6.14	5.10
10. Virginia	10.58	82.17	27.76	3.35	2.12	3.49	5.08	6.20
11. Wisconsin	9.43	71.43	28.19	4.47	2.77	3.74	4.76	5.00
12. Indiana	10.46	75.95	28.64	4.23	2.58	4.45	6.28	6.46
13. Ohio	10.95	86.21	30.87	3.71	2.25	3.17	5.85	6.72
14. New Hampshire	13.48	84.80	31.43	5.04	3.05	6.13	8.96	7.57
15. Connecticut	12.64	93.35	32.89	5.24	3.71	4.63	7.18	7.23
16. Maryland	12.30	93.03	37.81	5.21	2.87	3.94	5.70	6.32
17. New Jersey	11.58	99.20	38.87	5.46	2.30	3.39	5.11	5.26
18. Illinois	13.28	116.65	43.49	6.30	3.41	4.77	6.16	6.80
19. Pennsylvania	14.75	121.40	46.25	7.00	3.39	4.38	6.64	7.56
20. Missouri	16.38	130.20	49.84	7.50	4.05	6.15	8.46	8.58
21. California	16.87	134.26	50.67	9.34	4.46	6.39	7.98	9.13
22. Louisiana	20.97	159.12	53.37	8.18	4.99	6.89	11.28	14.95
23. New York	15.64	148.42	53.56	6.14	3.12	4.79	7.62	8.75
24. Massachusetts	17.66	158.48	58.33	7.07	4.02	6.78	9.50	10.31

It is noticed, with regret, that the position of California (No. 21) indicates a *high* coefficient of mortality among children, which ill accords with the reiterated boast of the superior salubrity of its climate. To some extent, doubtless, this high mortality among children may be due to the large fraction of the population of the State which is crowded into the City of San Francisco. Nevertheless, it may be proper to add, that California ranks comparatively *high* in its death rate at *all periods* of life, as may be seen by an inspection of the numbers in Table II. This significant fact must warn us that our State affords a proper domain for the rational application of sanitary regulations.

The position of Louisiana is exceptional, especially in its high mortality among *adults*. This is probably due to the large mortuary influence of the City of New Orleans.

It would be interesting as well as instructive to compare, in a detailed manner, the above results, with those deduced from the census of 1880. The annexed supplementary *table*, relating to mortality under five years of age in *eight* States, seems to indicate a *higher* mortality in all of them in 1880, as compared with 1870, with the *exception* of California and Louisiana. Perhaps the obvious disparity in the numbers deduced from the two census returns may be due to improved registration of both the living and the dead:

White Population.—Census of 1880.

STATES.	Living Under 5 Years in 1880.	Deaths Under 5 Years in 1880.	Deaths in 1,000 Living in 1880.	Deaths in 1,000 Living in 1870.	Deaths in 1,000 Living at all Ages in 1880.	Deaths in 1,000 Living at all Ages in 1870.
Alabama	110,802	3,291	29.70	18.87	12.58	9.08
North Carolina	138,079	5,081	36.81	19.73	14.03	8.97
Georgia	133,993	4,334	32.34	23.67	12.48	9.97
Vermont	33,972	1,208	35.56	24.67	15.12	10.73
California	90,537	3,258	35.99	50.67	13.64	16.87
Louisiana	69,794	2,415	34.60	53.37	15.47	20.97
New York	552,167	32,763	59.52	53.56	17.28	15.64
Massachusetts	177,225	11,415	64.41	58.33	18.55	17.66

MORTALITY FROM SPECIAL DISEASES.

As previously indicated, it is in estimating the mortality from *special causes* that the fallacy of the ordinary methods is most conspicuous and misleading. In relation to special diseases, it is customary to compare the number of deaths from the given malady with the total deaths from all causes, or with the total number of persons living at all ages. We have already shown that the proportional numbers thus deduced do not accurately represent the relative tendency of such disease to destroy human life; but that the true *coefficient of mortality* for any given malady is expressed by the *ratio* of the number of *deaths* from the given disease at the given age to the number of persons *living* at the same age. Of course, the fallacy of the ordinary methods of comparison is most conspicuous and striking, when *age* is the controlling element in the liability to attack from the specified disease. In such cases, the correct relative coefficient of mortality is expressed by the number of deaths from the given disease at the given age, in every one thousand persons living at the same age. Thus, for example, phthisis and cancer are essentially diseases of *adult life;* and consequently, it would be manifestly fallacious to estimate the mortality from either of them by comparing the number of deaths with the total number of persons living at all ages, instead of the number of *adults* living.

In illustrating the importance of taking the number of persons living at each age as the basis of comparison in estimating mortality, I have, for several reasons, selected CANCER:

First—Because, in relation to the influence of *age*, it furnishes an *extreme case*, and thus affords a *glaring* illustration of the fallacy of the customary methods of estimating mortality.

Second—Because, in relation to *sex*, and in several other respects, it furnishes an interesting example of mortuary researches.

Third—Because much of the arithmetical portion of the work (by no means an insignificant labor) was performed by me many years ago, so that the population estimates, as well as the numerical comparisons, are at hand.* It would, doubtless, have been more satisfactory to have included in this discussion the rich and precious vital and mortuary data which have accumulated since these calculations were executed, and to have embraced *other* diseases in the investigations; but the development of this interesting field of research must be reserved for the industry of future statistical investigators. In the meantime, CANCER will serve to illustrate the point to which attention is specifically directed.

1. AGE.—The mortuary data, illustrating the influence of *age* on the development of *Cancer*, are drawn from a memoir, presented to the Academy of Sciences of Paris during the year 1843, by M. TANCHOU. (*Gazette des Hopitaux*, for July 6, 1843.) It embraces nine thousand one hundred and eighteen deaths from cancer, which occurred in the Department of the Seine, in France, during the *eleven* years from 1830 to 1840, inclusive. These mortuary data are collected in the following TABLE, from which many instructive deductions may be drawn.

TABLE III.

AGE.	DEATHS FROM CANCER IN ELEVEN YEARS.			MEAN ANNUAL DEATHS FROM CANCER (COMPUTED).			Ratio of Males to Females.
	Males.	Females.	Both Sexes.	Males.	Females.	Both Sexes.	
1 to 10 years ----	9	14	23	0.818	1.273	2.091	1 to 1.55
10 to 20 years ----	13	13	26	1.182	1.182	2.364	1 to 1.00
20 to 30 years ----	62	169	231	5.636	15.364	21.000	1 to 2.73
30 to 40 years ----	190	822	1,012	17.273	74.727	92.000	1 to 4.33
40 to 50 years ----	339	1,636	1,975	30.818	148.727	179.545	1 to 4.82
50 to 60 years ----	488	1,620	2,108	44.364	147.273	191.637	1 to 3.32
60 to 70 years ----	598	1,469	2,067	54.364	133.545	187.909	1 to 2.46
70 to 80 years ----	398	917	1,315	36.182	83.364	119.546	1 to 2.30
80 to 90 years ----	62	273	335	5.636	24.818	30.454	1 to 4.40
90 to 100 years ---	4	22	26	0.364	2.000	2.364	1 to 5.50
All ages -------	2,163	6,955	9,118	196.636	632.273	828.909	1 to 3.215
20 to 100 years ---	2,141	6,928	9,069	194.636	629.818	824.454	1 to 3.236

From this table we learn the number of persons dying from cancer at each specified period of life; but, as previously intimated, we are by no means warranted in the conclusion which might seem to follow, viz.: that these numbers represent the *relative tendency* to this disease at different ages. This is a most serious error into which many writers frequently fall, when treating of the influence of *age* on the development of diseases. It must be borne in mind that the number of persons *living* at different ages is very unequal. For instance, it appears from the table that one thousand six hundred and twenty females died from cancer between the ages of fifty and sixty, while only nine hundred and seventeen perished from the same cause between the ages of seventy and eighty; but, if the number of females *living* of the former age were somewhat more than *double* that of those alive of the latter age, the *true* proportional mortality at both decennial periods of life would have been nearly *equal*.

In order, therefore, to ascertain with accuracy whether particular ages exercise any influence on the development of the disease, we must compare absolute mortality at each age with the number of persons *living* at those ages. As the mortuary records under consideration extend through a period of eleven years, we are not warranted in assuming that the population was *stationary* during this time; but, we may assume, without sensible error, that the population of the Department of the Seine, according to the enumeration of 1836, is a fair estimate of the *average* number living during the eleven years from 1830 to 1840, inclusive. Now, the population of the Department of the Seine (embracing Paris and the *arrondissements* of Sceaux and St. Denis) was, in 1836, one million one hundred and six thousand eight hundred and ninety-one. Assuming the proportional numbers of the sexes to be the same as they were in England about this period, and we have five hundred and forty thousand seven hundred and thirty-eight males and five hundred and sixty-six thousand one hundred and fifty-three females. Again, assuming the number of persons of each sex living at each age in France to be in the same proportion as in England in 1841, and we are furnished with the data required for computing the results embraced in the following table. The numerical elements of Table III are of course used in the calculations. The English estimates of the number living at each age are furnished by census of 1841, and may be found in the American Almanac for 1846.

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* *Vide*, Monograph by the author, entitled "Statistical Researches on Cancer." "Southern Med. and Surg. Journal," new series, vol. 2, pp. 257 to 293, May, 1846.—*Also*, "Vital Statistics: Illustrated by the Laws of Mortality from Cancer." "Western Lancet," vol. 1, No. 3, pp. 176-189, March, 1872.—*Also*, "The True Coefficient of Mortality." "Nature," vol. 24, No. 616, p. 357, August 18, 1881.

TABLE IV.

AGE.	ESTIMATED NUMBER LIVING.			MEAN ANNUAL DEATHS FROM CANCER IN 1,000 LIVING.		
	Males.	Females.	Both Sexes.	Males.	Females.	Both Sexes.
Under 10 years	139,186	139,840	279.026	0.00588	0.00910	0.00749
10 to 20 years	115,556	115,269	230,825	0.01023	0.01026	0.01024
20 to 30 years	92,736	104,342	197,078	0.06078	0.14725	0.10655
30 to 40 years	69,485	73.203	142,688	0.24858	1.02081	0.64476
40 to 50 years	52,073	54,124	106,197	0.59182	2.74788	1.69068
50 to 60 years	34,607	36,800	71,407	1.28192	4.00198	2.68372
60 to 70 years	22,928	25,703	48,631	2.37111	5.19564	3.86399
70 to 80 years	11,085	12,852	23,937	3.26399	6.48659	4.99417
80 to 90 years	2,866	3,680	6,546	1.96669	6.74408	4.65239
90 to 100 years	216	340	556	1.68110	5.88769	4.25114
All ages	540,738	566,153	1,106,891	0.36364	1.11679	0.74886
20 to 100 years	285,996	311,044	597,040	0.68055	2.02439	1.38077

The foregoing table demonstrates the *inaccuracy* of the prevailing opinion, that the tendency to cancer is at its *maximum* between the ages of thirty-five and fifty years. The abrupt augmentation of *general* female mortality between the ages of forty and fifty, when taken in connection with the equally sudden diminution of the intensity of fecundity among women at the same epoch of life (as exhibited in the Swedish tables), has been supposed to lend support to the validity of the current opinion, respecting the proclivity to uterine and mammary cancer, during the declining activity and cessation of the reproductive functions. But Table IV shows, on the contrary, that, in both sexes, the true coefficient of mortality from cancer goes on steadily augmenting with each succeeding decade until the eightieth year, and among females until the ninetieth; after that period, the number of cases is probably too small to furnish any reliable comparison. No *sudden and abrupt* alteration of the law of mortality from cancer in the sexes is here exhibited at that critical period of life. In fact, the greatest *increase* of death rate among females takes place between twenty and thirty, when the intensity of fecundity is probably at its *maximum*. Indeed, after twenty-five or thirty years of age, the *rate of increase* of the death rate with advancing life is *remarkably uniform* among *females* up to eighty; the *average* of these five decennial periods being about 1.30 per one thousand living for *each decade*. Among *males* the increase is not so regular; arising, probably, from the smaller numbers embraced in our statistical data.

The numbers in the following table will illustrate several points in relation to the proper method of estimating the mortality from cancer. The numerical data of Tables III and IV are used in the computations.

TABLE V.

(1) Ages—Years.	(2) Number Living.		(3) Mean Annual Deaths from Cancer.		(4) Annual Deaths from Cancer in 1,000 Living at all Ages.		(5) Annual Deaths from Cancer in 1,000 Living at Each Age.	
	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.
Under 10 years	139,186	139,840	0.818	1.273	--------	--------	--------	--------
10 to 20 years	115,556	115,269	1.182	1.182	--------	--------	--------	--------
20 to 30 years	92,736	104,342	5.636	15.364	0.0104	0.0271	0.0608	0.1473
30 to 40 years	69,485	73,203	17.273	74.727	0.0319	0.1320	0.2486	1.0208
40 to 50 years	52,073	54,124	30.818	148.727	0.0570	0.2627	0.5918	2.7479
50 to 60 years	34,607	36,800	44.364	147.273	0.0824	0.2601	1.2819	4.0020
60 to 70 years	22,928	25,703	54.364	133.545	0.1005	0.2359	2.3711	5.1956
70 to 80 years	11,085	12,852	36.182	83.364	0.0669	0.1508	3.2640	6.4866
80 to 90 years	2,866	3,680	5.636	24.818	0.0104	0.0438	1.9667	6.7441
90 to 100 years	216	340	0.364	2.000	0.0007	0.0035	1.6811	5.8877
All ages	540,738	566,153	196.636	632.273	0.3636	1.1168	0.3636	1.1168
20 to 100 years	285,996	311,044	194.636	629.818	--------	--------	0.6806	2.0244

The numbers in columns (3) and (4) in the foregoing table might seem to support the popular idea that the mortality from cancer attains its maximum between the ages of forty and sixty years; but, as we have previously shown, the numbers in column (5) are evidently the *true indices* of the relative tendency to this disease at different ages; and it will be observed that the death-rate per one thousand living at each age among females goes on steadily augmenting with each succeeding decade of age up to ninety years. A glance at the numbers in columns (4) and (5) is sufficient to illustrate the fallacy of estimating the *relative tendency* to cancer at different ages by the ratio which the annual deaths from it at each age bears to the *total* population living, instead of the number living at *each age*. These facts may be expressed *graphically*, according to the method of analytical geometry, as represented in annexed *diagrams*.

In these diagrams the lengths of the horizontal lines indicate (on the scales above given), the proportional numbers in columns (4) and (5) in Table V. A comparison of the two diagrams renders manifest to the eye the fallacy and misleading character of the method of estimating the mortality from cancer at different ages in the manner represented by the diagram on the *left*. It is obvious that the same fallacy is involved in every method of estimating the influence of *age* on mortality by comparing the number of deaths at each period of life with any *fixed numerical quantity*. Hence, in deducing the influence of *age* on the *death-rate*, the following methods give *fallacious* results :

(1.) The *relative number* of deaths at each period of life.

(2.) The *ratio* of the number of deaths from the *given cause* at *each age*, to the *total* number of deaths from the *same cause*, in the same population and at the same epoch.

(3.) The *ratio* of the number of deaths from the *given cause* at *each age*, to the *total* number of deaths from *all causes* in the same population and at the same epoch.

(4.) The *ratio* of the number of deaths from the *given cause* at *each age*, to the *total* population living at *all ages* and at the same epoch.

In the case of cancer, *each* of the foregoing *fallacious* methods, when represented by a *graphic projection*, would form a diagram similar to that on the *left*.

The fact likely to be most strongly impressed on the reader by the numbers in column (5) of Table V, as well as the delineation in the diagram on the *right*, is the remarkable *regularity* of the *increase* of the coefficient of mortality from cancer with advancing life among *females* after the age of twenty-five or thirty years. After seventy-five or eighty years of age the law appears to be disturbed by irregularities; but this probably arises from the fact that the number of cases after this epoch is too *small* to admit of useful comparison. Between the ages of twenty-five and seventy-five years the mortality increases nearly in *arithmetical progression as the age augments in arithmetical progression;* the *mean increment* being about 1.30 per one thousand living at each age for each *decade* of advancing life, or about 0.13 per one thousand living at each age for each *yearly* increase of age. Since the mortality augments in arithmetical progression, it follows that the *average* mortality *between* twenty and thirty equals mortality *at* twenty-five; mortality *between* thirty and forty equals mortality *at* thirty-five, and so on up to the age of seventy-five. Assuming this to be the *law* of mortality from cancer among *females* in the Department of the Seine, it admits of very simple mathematical expression. Thus, let—

$A=$ Age (in years) at which the *liability* to cancer *begins;*

$\acute{A}=$ Any age (in years) *greater* than A;

$K=$ A *constant numerical coefficient;* probably *variable* according to *country*, state of *civilization*, *density* of population, *race*, etc.;

$M=$ Annual mortality per one thousand living at age $\acute{A}$.

Then, we have, $M=K\times(\acute{A}-A)$.

To apply this formula to the statistical data embraced in Tables IV and V, let us assume that the *liability* to cancer *begins* at the age of twenty-five years—that is, $A=25$ years, and that $K=0.13$. Then our formula becomes:

$$M=0.13\times(\acute{A}-25).$$

The accordance of the results given by this formula with the numbers given in the tables is exhibited in the following numerical comparisons:

AGES.	Values of M. by Tables.	Values of M. by Formula.
25 years	0.14	0.00
35 years	1.02	1.30
45 years	2.74	2.60
55 years	4.00	3.90
65 years	5.20	5.20
75 years	6.49	6.50
85 years	6.75	7.80*

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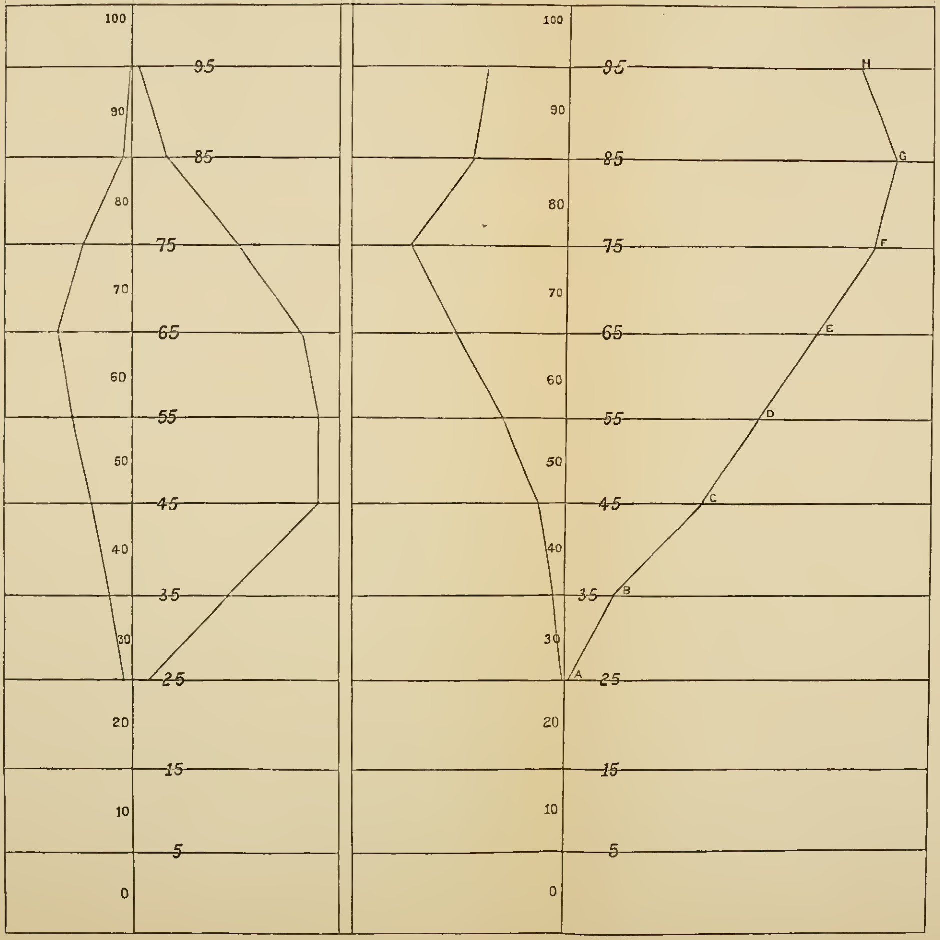
* It is evident, that by the *formula*, the broken line a, b, c, d, e, f, g, h, in the diagram on the right, would be a *straight line.*

Annual Deaths in 1,000 Living at All Ages.		Annual Deaths in 1,000 Living at Each Age.	
Vertical Scale=Age=0.6 Inch=10 Years.		Vertical Scale=Age=0.6 Inch=10 years.	
Horizontal Scale=0.2 per 1,000 Living=1 Inch.		Horizontal Scale=3 per 1,000 Living=1 Inch.	
Males.	Females.	Males.	Females.



The foregoing formula represents the law of increasing mortality from cancer among females with advancing age in the *simplest* form, as a *function of the age.* This extreme simplicity is probably *unique* in the case of cancer, and seems to indicate that *age* is so far the controlling element in the development of this disease as to overpower all other causes. In the case of *other* diseases, we cannot expect to escape the necessity of employing those *exponential* functions in investigating their laws of mortality, which are essential when a multiplicity of causes are in operation.

2. Sex.—The *relative mortality*, or the *relative frequency*, of cancer in the two sexes may be learned from Mr. William Farr's valuable reports on the causes of death throughout England and Wales, as likewise from the statistical data furnished by the researches of M. Tanchou, at Paris. As there exists a certain degree of numerical superiority on the side of the female population, in order to make the comparison perfectly fair, it is necessary to calculate the rate of mortality in relation to the numbers living of *each sex.* This has been done in the annexed *table:*

TABLE VI.

Country.	Year.	Estimated Number Living.		Annual Deaths from Cancer.		Annual Deaths from Cancer in 1,000 Living.		Ratio of Males to Females.
		Males.	Females.	Males.	Females.	Males.	Females.	Ratio.
England and Wales	1838	7,469,450	7,829,451	620	1,828	0.0830	0.2335	1 to 2.813
England and Wales	1839	7,572,873	7,932,874	660	2,031	0.0871	0.2560	1 to 2.938
Department of Seine	1830–40	540,738	566,153	197	632	0.3636	1.1168	1 to 3.071
Average								1 to 2.941

It would have been more accurate to have compared the number of deaths from cancer for each sex with the number living between the *cancerable ages* (say between twenty and one hundred years), instead of the number living at *all ages;* but while this more correct method would have nearly *doubled* the coefficient of mortality for each sex, yet the *ratio* would *not* have been *sensibly altered.* The foregoing table shows that in both England and France the annual mortality from cancer among females *exceeds* that among males, nearly in the proportion of three to one. This striking difference in the liability to cancer in the two sexes is the more remarkable from the fact that the average annual mortality from all causes, in the English population, in the five years, 1838–42, was 22.94 per one thousand living among males, while it was only 21.24 per one thousand among females. It is true, the *expectation of life* among women exceeds that of men by about two years; and consequently a greater proportional number of the former live to an *advanced age*, the period of life which, as we have seen, is most obnoxious to cancer. But this is wholly insufficient to account for the vast disparity in the mortality from this disease in the two sexes. For, by comparing the numbers given in column (5) of Table V, it will be seen that the excess is maintained by the females throughout life, even long after the reproductive functions have become dormant. And it is a still more remarkable fact that this *ratio* appears to be sensibly the *same* in England and in France. Although, in the Department of the Seine, in each of the sexes (see Table VI), the mortality from cancer was more than *four times* as great as it was in England at the corresponding epoch, yet the *constancy of the ratio* between the two sexes is not disturbed. These facts indicate a *law* in relation to the influence of *sex* on the development of cancer, which is as *fixed* and as *uniform* in its operation as that of *age*, and seem to point to certain original and fundamental *physiological differences in the sexes* as the *true causes* of the excess of death from this disease among females. That such connate differences do exist seems to be rendered probable from the fact, noticed by Dr. Emerson, of Philadelphia,* that the diseases most fatal to *male* children seem to be of the *sthenic* class, such as attend upon constitutions in which the energies of organic life are highly exalted; whereas, those which are most destructive with *female* children are of the *asthenic* class, characterized by less energy of the forces of organic life, and greater feebleness of the system. It is obvious that *cancer* appropriately belongs to the *latter* class.

3. SECULAR VARIATION OF MORTALITY.—Whether the mortality, or frequency of cancerous diseases, is on the *increase*, or otherwise, is a question of considerable interest and importance; but one to which a satisfactory reply cannot be furnished, until we have the means of properly ascertaining the proportion of the population annually cut off by this disease during a *long series of years*. A little reflection will show that a numerical comparison between the number of deaths from any given cause, and the total mortality from all causes is *not* an accurate test of the relative frequency of the specified disease at several successive epochs. For, not only is the population a variable element, but the general mortality, as compared with the number living, varies with the increase or decrease of epidemic diseases. The most *accurate test* consists in calculating the ratio of the number of deaths from cancer for each year between the *cancerable* ages, to the number of persons living between the *same ages*. But this more correct method involves such an amount of arithmetical labor, that we must be content with the approximate method of calculating the ratio of the whole number of deaths from cancer for each year, to the total population living at the *same time;* for while the *absolute* coefficient will be different, yet the *relative* mortality at successive epochs will not be *sensibly* disturbed. But to make this comparison for a series of years, it is necessary to know the *rate of increase* of the population in which the mortuary records are kept. The enumerations of 1826 and 1836 furnish the data necessary for estimating the population of the Department of the Seine for successive years, and those of 1831 and 1841 offer similar data for England and Wales. With the aid of the foregoing hints, the mode of computing the following table will be apparent to the reader. The numbers indicating the absolute deaths from cancer in each year were obtained from the Memoirs of Tanchou, and the reports of the Registrar-General of England. The first three proportional numbers for London were taken from McCulloch's "Statistical Account of the British Empire," vol. II, second edition, page 577, London, 1839. They are, however, of little value in relation to the question under consideration.

The numbers relating to Glasgow are computed from the data furnished in Nicol's "Vital, Social, and Economic Statistics of the City of Glasgow, 1881–85," pages 36–44. Those relating to Massachusetts are taken from the report of the Massachusetts State Board of Health for 1886, as cited in "Science," vol. X, page 213, October 28, 1887.

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* *Vide* "Amer. Journal of Med. Sciences," January, 1846, p. 91 et seq.

TABLE VII.

	Years.	Estimated Population.	Annual Deaths from All Causes.	Annual Deaths from Cancer.	Deaths from Cancer in 1,000 Deaths.	Deaths from Cancer in 1,000 Living.
London	1728–57				2.00	
London	1771–80				3.40	
London	1831–35				4.40	
London	1837					0.2080
London	1840–41		80,321	638	7.95	
Paris	1830–40	909,126		727		0.8014
Sceaux et St. Denis	1830–40	197,765		102		0.5407
Department of Seine	1830	1,049,793		668		0.6363
Department of Seine	1831	1,059,100		865		0.8167
Department of Seine	1832	1,068,491		814		0.7618
Department of Seine	1833	1,077,964		814		0.7551
Department of Seine	1834	1,087,521		857		0.7880
Department of Seine	1835	1,097,164		906		0.8258
Department of Seine	1836	1,110,891		837		0.7562
Department of Seine	1837	1,116,705		778		0.6967
Department of Seine	1838	1,126,606		803		0.7128
Department of Seine	1839	1,136,594		887		0.7804
Department of Seine	1840	1,146,672		889		0.7753
Department of Seine (Mean)	1830–40	1,110,891	34,805	829	23.82	0.7550
England and Wales	1838	15,307,065	330,559	2,448	7.4056	0.1599
England and Wales	1839	15,511,264	330,497	2,691	8.1423	0.1735
England and Wales	1840	15,718,183	351,757	2,786	7.9202	0.1772
England and Wales	1841	15,927,867	336,664	2,746	8.1565	0.1724
England and Wales	1842	16,140,344	342,774	2,941	8.5800	0.1822
England and Wales	1860	19,902,713	422,721	6,827	16.1501	0.3430
England and Wales	1861	20,119,314	435,114	7,276	16.7221	0.3616
England and Wales	1862	20,336,467	436,566	7,396	16.9413	0.3637
England and Wales	1863	20,554,137	473,837	7,479	15.7839	0.3639
Glasgow	1881–84	526,000		246		0.4678
Massachusetts	1867					0.2900
Massachusetts	1886					0.5600

A comparison of the proportional numbers contained in the last two columns of that portion of the foregoing table relating to England and Wales, clearly illustrates the fallacy of estimating the relative frequency of cancer by the ratio which the annual deaths from it bears to the total yearly mortality from all causes. For instance, the proportion of deaths from cancer in one thousand deaths is, in 1840, considerably *below* that of 1839; whereas, the ratio per one thousand living is *above* it. In like manner, the mortality in one thousand deaths in 1863 is *below* that of 1862; whereas, the ratio per one thousand living is very slightly *higher*. On the other hand, in 1841, the ratio of deaths from cancer to the general mortality for that year shows a considerable *increase* in frequency over 1840; whereas, the ratio deduced from the number living at that time indicates a relative *decrease* of deaths from that disease. In fact, it is evident that the total annual mortality—principally from the influence of *epidemics*—is more liable to *fluctuations* than the mortality from cancer, and, hence, the ratios deduced from a comparison of the two would show a corresponding and proportionate oscillation, wholly independent of any *real* variation in the mortality from cancer. Doubtless the fluctuations in the general mortality are governed by fixed laws; but we are not as yet in possession of sufficient data for estimating the value of the coefficients representing these perturbations, so as to apply them in our average reductions.

In relation to the important question of the *secular increase* in the mortality from cancer, the numbers contained in the *last* column of Table VII (the only *correct criterion*) afford a tolerably satisfactory answer. It will be noticed that the French data indicate, in a general sense, that this disease is *augmenting* in frequency in the Department of the Seine, but the increase is by no means uniform from year to year; it is irregularly progressive. The mortality from this cause seems to have increased in eleven years from 0.636 to 0.775 per one thousand living at the two extreme periods embraced in the records; being equivalent to a *mean annual* increment of 0.0126 per one thousand living.

The English statistics, embracing a period of twenty-six years, furnish results which are far more uniform and satisfactory. These seem to indicate very clearly that there has been a progressive *increase* in the death rate from cancer during the interval in question, from 0.160 in 1838 to 0.364 in 1863, per one thousand living; being a *mean annual* increment of about 0.0785 per one thousand living. This seems to be a most extraordinarily *large* augmentation; but it is fully sustained by the mortuary data furnished by Massachusetts. It thus appears to be pretty clearly demonstrated by these figures, that cancerous diseases are *increasing* in frequency both in France and in England; although the data are probably insufficient to determine the *law* of the increment.

It may be instructive to contrast the mortuary data in relation to coefficient of mortality for *consumption* or *phthisis* with those for *cancer*, so far as they are embraced in the *same* interval of time in the statistics of England and Wales. The annexed table furnishes the results of computations based upon data contained in Table VII, combined with those given in the reports of the Registrar-General of England:

TABLE VIII.

	Years.	Annual Deaths from Phthisis.	Deaths from Phthisis in 1,000 Deaths from All Causes.	Deaths from Phthisis in 1,000 Living.
England and Wales	1838	59,025	178.56	3.996
England and Wales	1839	59,559	180.21	3.939
England and Wales	1840	59,923	170.38	3.897
England and Wales	1841	59,592	177.01	3.822
England and Wales	1842	59,291	172.97	3.673
England and Wales	1860	50,149	118.66	2.520
England and Wales	1861	51,931	119.35	2.581
England and Wales	1862	50,962	116.73	2.506
England and Wales	1863	51,072	107.78	2.485
Massachusetts	1867	---------------	---------------	3.250
Massachusetts	1886	---------------	---------------	2.980

A comparison of the numbers in the last two columns of this table again illustrates the greater *irregularity* of the ratios deduced from the *deaths* from *all causes*, as compared with those computed from the number of persons *living*. But the most interesting and significant fact brought to view by a glance at the numbers in the last column of Table VIII is that in the case of phthisis—unlike cancer—there is *no indication* of a *secular increase* in the coefficient of mortality. On the contrary, the figures appear to show very manifestly a progressive *decrease* in the death rate from this disease. It is certainly encouraging to discover that the development of medical science with advancing civilization has had an appreciable influence in abating the ravages of this scourge of the human race. In this respect, the *contrast* with cancer, as exhibited by the numbers in the last column of Table VII, is very striking.

Nearly all of our statistical data appear to indicate that in the case of cancer there has really been a *secular increase* in mortality, both in France, and in England and Wales. It would be premature to attempt to express this increment in numbers as a *time-factor* in our formula for the influence of *age* on the mortality from cancerous diseases. The rational discussion of such questions must be postponed until some zealous investigator of vital statistics arises, who has the leisure and the courage to properly analyze the vast accumulation of valuable facts which are entombed in the mortuary registers of the last forty years. It is the opinion of M. Tanchou that cancer, like *insanity*, increases in a direct ratio to the civilization of the country and of the people.*

In regard to the probable *causes* of this presumed increase in the mortality from cancer, it may be proper to remind the reader, that to some extent, the augmentation may be only *apparent;* since it may arise from more careful registration, from improvements in pathology, and from greater accuracy in diagnosis. It is difficult to estimate the influence of these circumstances. But there is another cause of this apparent increase of mortality which is far more *definite.* It is a well established fact, that the *mean duration* of human life has, even within a comparatively short time, been sensibly *increased*, by the rapid advancement of medical science and by a more philosophical application of hygienic and sanitary regulations. In London, according to Mr. Chadwick, the mean duration of human life increased *four years and nine months* in the one hundred and three years from 1728 to 1830. At Geneva, M. Edouard Mallet estimates that the mean duration of life has augmented in two hundred and seventy-four years (from 1560 to 1833) in the proportion of the numbers 100 to 191. Admitting the well determined and powerful influence of *age* upon the production and development of cancer, the *increase* in the duration of life stands in the nature of a *vera causa*, tending to augment the frequency of the disease; inasmuch as a greater proportion of the population would reach that period of existence which is peculiarly obnoxious to such affections. In other terms, the prolongation of human life incident to the progress of civilization must tend to *increase* the frequency of such diseases as are dependent upon advanced age for their production and development. Under this point of view, unless science can discover means of controlling the operation of ulterior causes, the increase of mortality from cancer must,

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*The conclusion that cancer is *increasing in frequency* was first announced by the author in one of his earliest papers, entitled: "On Carcinoma in General and Cancer of the Stomach." "Trans. of the Society of Alumni of College of Physicians and Surgeons of the State of New York," No. 1, pp. 9-16, New York, 1842. *Also*, "New York Lancet," vol. 2, October 29 and November 5, 1842, pp. 284-287, and 299-304. This deduction was based upon the meager and imperfect mortuary data furnished by London, which seemed to show that the ratio of the annual deaths from cancer to the total annual mortality in that city had *increased* in one hundred and thirteen years (1728 to 1841) from 2.00 to 7.95 per one thousand deaths from all causes. (*Vide* above Table VII.) About eight months later (July, 1843), as already cited, M. Tanchou, by a totally independent course of investigation, arrived at an analogous result, with respect to the prevalence of this disease in France. This induced the author to undertake a more elaborate and rigorous investigation of the question in his Monograph, previously cited, entitled, "Statistical Researches on Cancer," published in May, 1846, which seemed to confirm his original conclusion.

indeed, be coextensive with the progressive advancement of human civilization. Future statistical investigators will be able to test the validity of this pessamistic view, by determining whether the alteration in the duration of life is adequate—through the influence of *age alone*—to explain the *whole* of the observed secular augmentation of mortality.

4. MORTALITY IN FRANCE AND ENGLAND.—We have already incidentally called attention to the remarkable *difference* in the mortality from cancer in France and in England at epochs nearly corresponding. A glance at the numbers contained in Tables VI and VII reveals a most striking and singular fact, viz.: the *enormous excess* of the mortality from cancer in the Department of the Seine, as compared with that in England and Wales at sensibly the same epoch. Of course, in view of the large *secular variation* of mortality, no comparison can be perfectly *fair* that does not involve sensibly the *same* period of time or years. The numbers in the last column of Table VII show that the proportional mortality from cancer—1830–40—in France, is to the mortality in England—1838–42—as 755 to 173. It is very difficult to imagine a plausible explanation of this curious and perplexing disparity. Perhaps some may be disposed to ascribe it to a greater latitude in the application of the term *cancer* on the Continent. But the English bills of mortality—at least since the Registration Act has been in operation—do not exhibit any such difference in the nomenclature of disease. Both in France and in England nearly all local malignant affections are included under the name cancer. Moreover, even if, with Mr. Farr, we include *tumors of uncertain seat* among the cancerous affections the disparity is *not sensibly* altered. For, making this allowance, the ratio becomes 755 to 191. So that the mortality from cancer in the Department of the Seine is nearly *quadruple* what it is in England and Wales, about the same time. Perhaps the habit of making necroscopic examinations may be more common in the French metropolis than it is in England, and thus a greater number of *internal* cancers may be detected and registered. But it is hardly reasonable to suppose that the disparity growing out of this circumstance would amount to the enormous proportion of 4 to 1. In view of M. Tanchou's idea, that the mortality from cancer is in a *direct ratio* to the intensity of human civilization, it may be, to some extent, consolatory to the inhabitants of England to discover that their more recent mortuary records, from 1860 to 1863, inclusive, indicate a very remarkable *increase* in the death rate from this disease

The exact agreement in the proportional mortality from cancer among *males* and *females* in the two countries in question, as exhibited in Tables V and VI, demonstrates that whatever may be the cause of the disparity, *it operates with equal intensity upon both sexes.* We have no means of ascertaining what may be the influence of diet, habits of life, physical geography, etc., on the production of cancerous affections. Neither is it possible to estimate what share *governmental* influences may have in the induction of the peculiar predisposition to such diseases. In assigning a relative value to the various causes which concur in the production and development of chronic maladies, physicians have almost entirely overlooked the evils, moral and physical, which have their origin in the *endemic agency of bad government.* Doubtless, in many instances, physical influences are, in a measure, subordinate to this silent and potent agent. Its operation is slow, insidious, and, perhaps, inappreciable amid the multiplicity of surrounding disturbing causes; but it is constant and unrelenting, and the effects are certain and inevitable. The canker of discontent and restlessness, which corrodes the vitals of a high strung and intelligent people, degraded and oppressed by misrule during a series of generations, must react on the physical system in a most powerful manner. So far as France is concerned, it may be difficult to reconcile the operation of such a cause with the proverbial gayety and elasticity of spirits which characterize her people. Yet it has been remarked that many of the cases of cancer of the stomach detailed by M. Chardel were furnished him during or immediately subsequent to the "Reign of Terror."

The want of access to the rich treasures of more recent mortuary records precludes the satisfactory discussion of many points in relation to cancer, such as the influence of habitation, occupation, married and single state, climate, season, etc., on the mortality from this disease.

In relation to *organs affected*, the researches of M. Tanchou show that the *uterus* is most liable to cancer, constituting about 32.8 per cent of the total deaths from the disease. The *stomach* comes next, 25.2 per cent; then the *mamma*, 21.7 per cent; and then the *liver*, 6.3 per cent, etc. Among *females* the mortality from *cancer uteri* is about 43 per cent of the total deaths from the disease in that sex, and the *mamma* 28.4 per cent. These proportions relate to the mortality from cancer in the Department of the Seine, in France. It would be interesting to secure similar statistical data in relation to England, so as to trace, if possible, the cause of the disparity in the mortality from cancer in these two countries. Such data are unquestionably entombed in the "Reports of the Registrar-General," but it would require the prolonged labor of an expert to extract them.

In conclusion, it is proper to remark that the science of vital statistics is in its infancy. This is the period for collecting facts; for multiplying observations; for establishing the basis for wider and higher generalizations. The condition of man in almost every region of the globe is changed, and we have only to look around us in the narrowest circle of the community to behold elements and principles in action, of whose existence a few years ago we had no conception. There are impulses on an immense scale impelling population forward; artificial wants of a new kind constantly creating; and the basis of the social system is widening and spreading into innumerable forms on every side. The "great constants" (to adopt an idea of the late Mr. Babbage), which mark these important changes, it is the business of statistical science to collect. Governments, perhaps for other reasons than those of a purely scientific nature, have become interested in the matter. The *census* is more carefully taken; *registrations* of births and deaths are more accurately noted. The medical philosopher is now furnished with better and more reliable data as the basis of his investigations. The census returns enable him to make population estimates for *every period of life*, and there is no reason why this *more accurate basis* should not be employed in discussing the relative mortality from different diseases. The problems presented are of the most complicated character, and all the resources of science are required to enable us to lay an effectual grasp upon them. We can scarcely expect the science of *living* matter to be less difficult, less complex, less in need of the resources of observation, experiment, and calculation, than the science of *dead* matter, than astronomy, physics, or chemistry.

BERKELEY, CALIFORNIA, August 16, 1888.

NOTES ON TOPOGRAPHY, AND ON THE DISTRIBUTION OF PLANTS IN CALIFORNIA.

By W. P. Gibbons, M.D., Alameda.

The Pacific Ocean furnishes nearly all the vapor for rains and storms for the greater part of this continent. It extends from the Arctic to the Antarctic Ocean, and covers an approximate area of fifty million square miles. From the time that the sun has passed the autumnal and returned to the vernal equinox, the full intensity of his rays are cast upon the surface of this immense ocean south of the equatorial belt. From March to September the greater heat falls north of the equator; in either case, large evaporation of water occurs, which has been estimated to aggregate fifteen inches of ocean surface; greater in the southern hemisphere, principally on account of its larger area of water. It will be taken for granted that the reader is familiar with the literature of trade winds, and with the theories connected with the formation and distribution of storms; as these are incidental but important points in connection with this essay.

Passing from west to east and between the parallels of 35 degrees and 40 degrees, the geological formation of California naturally divides its climate into three distinct sections: 1st. The Coast Range, extending about forty miles from the ocean to Mt. Diablo, on the western edge of the great valley; 2d. The San Joaquin and Sacramento Valleys, continuous in a northeasterly axis, about four hundred miles long and from forty to seventy miles wide; 3d. The Sierra section, which includes the foothills and mountains of that name. The Sierra Mountains, not less than nine thousand to twelve thousand feet high, form the great eastern wall of the valley, while the Coast Range, with its average of one thousand two hundred or one thousand five hundred feet of elevation, with peaks interspersed from three thousand to fifteen thousand feet high, constitutes its western side. As the foothills of the former range are traversed easterly, extensive areas of oak appear in places, which give way at a higher elevation, to numerous members of coniferæ, to manzanita, to alder, and other alpine vegetation.

For about forty miles inward from the commencement of the foothills, and to an elevation of four thousand feet above sea level, the winter climate is bland, seldom marking a temperature below 30 degrees, while in summer, in the absence of western winds, the range is from 70 degrees to 110 degrees. The average rainfall is between forty and fifty inches, though during some seasons much less. Occasionally winds sweep down from higher localities which are covered with snow, and the temperature may thus be reduced for days together. As a general rule fogs are an exception.

The necessary condition of the Sacramento and San Joaquin Valleys is that of a desiccated, treeless plain, except in proximity to river banks, where vegetation has flourished and belts of alluvium have been deposited. In such places, scattered groups of oaks and lines of willow and cottonwood, with occasional displays of sycamore, relieve the tedium of the vista. The vertical rays of the summer sun fall upon it with full intensity, giving a temperature from 80 degrees to 115 degrees. No dews or fogs alleviate the oppressive heat. About the southern extremity sandstorms are not unfrequent; while from the northern end there sweep down occasionally siroccos, which sear vegetation in their course, and which find an outlet through the western side of the Coast Range along the course of the rivers.

A noticeable feature on both sides of the valley is the absence of running water after the cessation of winter rains. Though maps designate more than fifteen gulches debouching from the west side of the Coast Range into the valley, which are dignified by name of rivers, not one of them contains running water during the summer months. The average rainfall along the Coast Range is about twenty inches; it gradually decreases in quantity toward Southern California; while in the great valley it seldom exceeds three or four inches. The general topography of California may be summarized as having a territory of one hundred and fifty-seven thousand eight hundred square miles, along the center of which is a valley from forty to seventy miles wide, flanked on either side by mountain ranges, and having on the line of its longitudinal axis two rivers, the San Joaquin and the Sacramento, both of which receive numerous tributaries and debouch from nearly the same point through Suisun and San Pablo into San Francisco Bay.

From Mt. Diablo west to the ocean, the climate of the foothills is greatly modified. Much of this section comes within the range of the westerly winds of summer; all of it, more or less, is the recipient of fogs, which prevail with varying density from April to September. The humidity of the ocean atmosphere varies, as does that over the territory of the foothills. There may be fog banks on the ocean and none on the land; or there may be fog on the land and none on the ocean; again, fogs may envelop both land and ocean; or both land and ocean may have a perfectly transparent atmosphere. The space alloted to this paper will not admit of going into an explanation of these climatic phenomena.

The Coast Range has large forests of timber, principally oak, redwood, and pine. The coniferæ do not form dense forests on the Sierras, below three thousand five hundred feet elevation, though the *Pinus sabiana* (Dougl.) begins to appear much lower, in isolated individuals; sometimes in groves covering small hills, sometimes along the flanks of table mountains, and in sections where there are no summer rains. This is familiarly known as the Digger pine, having received its name from a tribe of Indians which depended, in a great measure, on its nuts for winter store of provisions. From three thousand feet elevation, and upwards, dense forests of other coniferæ cover the mountain hillsides, interrupted, however, by granite formations, which occupy more than two thirds of the mountain superfices. These magnificent forests in places are wholly obliterated, wherever sawmills can be located, and a demand for lumber exists.

Reference to other reports to the State Board of Health will enable the reader to apply the general facts of topography herein stated, to matters pertaining to public health in California.

Geology teaches that the Sierra and the Coast Range Mountains belong to the cretaceous era. That time was, when the waves of the ocean laved their foothills, and but a few straggling and nude masses of rock marked the present line of the Pacific Coast.

Before geology was a science, this theory existed as a tradition, and it became crystallized in an historical shape in a map of California published in 1720, a copy of which is now in the archives of the Pioneer Society. It represents the Gulf of California extending northwesterly and covering the present valley of the Sacramento and San Joaquin, completely segregating the Coast Range formation from the continent.

From geological data, it is more than probable that at the period when a large portion of Arctic vegetation was in full vigor of life, the Sierras and the Coast Range Mountains had so recently emerged from the ocean that they were not adapted to modern forms of vegetable growth.

It is reasonable to suppose that on the oldest portion of the continent the highest forms of plants have had their origin. The progress of vegetation may thus be traced along those lines which are now represented by the presence of coal formations and of lignite. There was no way by which forest trees and plants could cover the isolated Coast Range Mountains but from the far north of the continent.

That the Arctic region was a point of distribution of forest trees is supported by the theory that the miocene forests of Europe probably migrated from America from the above source, and not from Europe. Among such trees we have in California the willow, the oak, the sycamore, the walnut, the sequoia, and others.

The fact of the genus sequoia being of Arctic origin, and having but one species—*S. gigantea*—sparsely diffused through the Sierra Mountains, while the other species—*S. sempervirens*, or redwood—forms such immense forests throughout the middle portion of the Coast Range, may be attributed, in part, to the distinct climatal conditions which environ their habitats. The former is found in few localities, where rain seldom falls between the months of April and November, and where high summer temperature prevails. Altitude does not appear as an important factor in its history. Probably on account of the dry summer atmosphere, its propagation by seed is exceedingly limited. John Muir, however, states that in the Fresno grove he observed large numbers of saplings. Unlike the redwood, they do not propagate by suckers from decaying stumps, possibly because of the absence of surrounding moisture. Winter temperature, mild about its localities, interposes no check to its growth. The writer has never seen nor heard of a redwood tree growing on the eastern side of the great valley.

The redwood, on the other hand, covers large areas with forest growth, within thirty miles of the ocean, and stretches along a distance of two hundred miles or more, parallel with the seashore. Its vigorous and enormous growth, sometimes attaining a diameter of over thirty feet, and its wonderful power of propagation from buds, evolving from the ground line of fallen trees and stumps, show its perfect adaptation of environments to life. Proximity to the ocean protects it from the high temperature of the interior, while westerly winds and fogs, almost continuous for about eight months of the year, darkens its surrounding atmosphere, and give it, essentially, all the conditions of a primitive Arctic climate. Nor is its territory invaded by a solitary known specimen of the *gigantea*, though soil and climate are so admirably adapted to both species. Hence, to attribute the migration of the redwood from parallel ranges of the Sierras, does not appear to be logical; certain it is, that the seeds of the redwood, or of any other tree, would meet with great difficulties in crossing the broad valley between the Coast Range and the Sierras, especially if its genesis on the present habitat is to be referred to a period when the diffusion of plants by birds is to be partially or wholly excluded from such agency—a conclusion which is not improbable, since Lesquereux, in Hayden's Geological Report of the Territories, designates and figures seven species of sequoia as having been found in tertiary deposits.

Says Dr. Gray—respecting the distribution of tertiary plants in the Arctic, and in their relation to similar kinds in the Eastern United States and Asia—that the northern parts of America, Europe, and Asia were, during that age, under a common forest vegetation with a comparatively moderate climate. Herr estimates from the miocene plants of Greenland that the mean annual temperature of the Arctic regions in the middle tertiary was as high as 48 degrees F. John Muir, in his botanical notes on the cruise of the Corwin, remarks ttha there is so much resemblance between vegetation of the polar regions and the Alpine valleys of temperate zones, that the botanist on the coast of Arctic Siberia or America might readily fancy himself on the Sierra Nevadas at a height of ten thousand to twelve thousand feet above the sea. The manner in which Arctic plants can adapt themselves to environments he tells in the fact that "the snow is universal during winter, and plants are solidly frozen and buried for nearly three fourths of the year. In this condition they enjoy a sleep and rest about as profound as death, from which they awake in June and July in vigorous health, and speedily reach a far higher development of leaf, and flower, and of fruit than is generally supposed."

The most satisfactory explanation of the manner in which forest growths may have been diffused through California is to be found in the action of glaciers. At the close of the tertiary, after high mountains had been elevated about the polar regions, the temperature became cooler, and gave origin to what is called the glacial age. These huge mountains of ice, starting from points where the snows of successive winters added to their volume, in breaking loose from their beds not only carried with them vast amounts of soil and drift, but uprooted forests and took them along by their irresistible momentum. Thus trees, plants, and seeds have been transported and left to germinate and grow in localities hundreds of miles and more from their primary habitat.

Illustrations of this force are not wanting along the mountain ranges of the Pacific Coast. The original and most reliable authority on the discovery, the formation, the life, and the transporting power, and the death of glaciers along this western shore of the continent is John Muir, whose publications from time to time have justly claimed the admiration and indorsement of the scientific world. He has demonstrated the possibility that the sequoia and other conifers and trees may have been transplanted in California from their Arctic habitat.

That many of our phanerogamous plants did not emigrate across the Rocky Mountains directly west, is apparent from the fact cited by Serena Watson, that of one thousand one hundred and forty-one species given in the list of the great basin of the Wasatch and the Uintas, 60 per cent are found on the Pacific slope and about the same proportion do not pass eastward beyond the Rocky Mountains. He furthermore states that a large proportion of Pacific species, not only arborescent, but shrubby and herbaceous, stop abruptly on the eastern slope of the Sierras and do not reappear eastward.

The deduction from foregoing statements is that many Arctic species of trees and plants must have been moved south as the glacial system worked its way along the line of tertiary deposits of the Pacific Coast. As previously stated, this was the view entertained by Professor Gray, and previously to his publication, by John Muir, who, after years of patient toil and investigation, first demonstrated the presence of living glaciers in California, in the face of repeated assertions by eminent geologists that no such formations were in existence.

There are other well known agents which effect the distribution of trees and plants, and though the subject would admit of much interesting discussion, the length of this article will preclude further remarks. When we consider that the present condition of the earth's surface has been the work of an indefinite period of time, and compare its former condition of incompatibility for life of any kind with its present state, when its fauna and flora teem with unnumbered forms, it is impossible to resist the conclusion, that in the future, as in the veiled history of the past, slow and rupturing revolutions will still progress; changing physical characters; modifying or destroying present types of existences; bringing forth new and more vigorous forms, and changing the physical aspects which belong to present races of men.

WEATHER REVIEW OF SACRAMENTO AND VARIOUS OTHER PORTIONS OF CALIFORNIA.

By Sergeant JAMES A. BARWICK, Observer Signal Corps, Sacramento, California.

The following meteorological data shows the general features of the weather for Sacramento, San Francisco, Red Bluff, and Los Angeles; also an article on the climate of Santa Barbara, as compared with Mentone and San Remo, two of the most prominent places on the Great Riviera of Italy; showing plainly what a fine climate, the year round, Santa Barbara has.

The table of mean temperature for the State of California was deduced from the Southern Pacific Railroad Company's records, and compiled from them by Sergeant Nelson Gorom, Observer Signal Corps, San Francisco.

The table of monthly rainfall was prepared under authority of Lieutenant J. E. Maxfield, Signal and Indications Officer for the Pacific Coast, San Francisco, by Francis Creighton, Observer Signal Corps.

A brief description of the various climates of California and of the Sacramento Valley will be found quite interesting. These articles were taken from the annual meteorological review of the State of California, and compiled by Sergeant James A. Barwick, Meteorologist to the State Agricultural Society.

GENERAL WEATHER REVIEW OF SACRAMENTO.

This city is geographically situated in latitude north 38° 35′; longitude west from Greenwich, 121° 30′; elevation above sea level, 35 feet; elevation of the zero point of the barometer cistern above sea level, 64 feet.

The following tabulated data show the general meteorological features of the weather of this city by seasons, winter, spring, summer, and autumn. Also, an annual review of the weather from 1878 to 1887.

COMPARATIVE WINTER WEATHER AT SACRAMENTO FROM 1877–78 TO 1887–88.

This table of winter comparisons shows the average, highest, lowest, and range of temperature; the average relative humidity and dew point; total precipitation; prevailing direction of the wind; total and maximum velocity, with the direction at the time of maximum velocity; total number of clear, fair, cloudy, and foggy days, and total number of days rain fell; number of snow storms; solar and lunar halos; light and killing frosts; and the number of days the temperature was below 32°.

WINTER OF:	1877–78	1878–79	1879–80	1880–81	1881–82	1882–83	1883–84	1884–85	1885–86	1886–87	1887–88
Average barometer	30.00	30.12	30.16	30.12	30.17	30.19	30.12	30.09	30.10	30.11	30.15
Highest barometer	30.38	30 51	30.68	30.46	30.52	30.74	30.58	30.43	30.40	30.51	30.63
Lowest barometer	29.46	29.77	29.47	29.48	29.75	29.68	29.42	29.49	29.32	29.54	29.50
Range of barometer	0.92	0.74	1.21	0.98	0.77	1.06	1.16	0.94	1.08	0.99	1.13
Average temperature	49.9	49.2	44.5	51.0	45.9	45.4	45.9	50.0	49.4	47.5	47.4
Highest temperature	67.0	73.5	64.0	67.0	62.8	71.7	71.0	70.0	72.7	67.0	75.0
Lowest temperature	27.0	23.5	25.0	35.0	29.0	22.0	21.0	27.0	27.5	30.0	19.0
Range of temperature	40.0	50.0	39.0	32.0	33.8	49.7	50.0	43.0	45.2	37.0	56.0
Average humidity	77.1	68.3	77.2	84.0	76.4	77.9	83.0	77.7	87.1	77.6	76.6
Average dew point	------	------	------	------	38.1	38.2	40.6	42.6	43.3	40.2	39.8
Prevailing wind	S.E.	N.	S.E.	S.E.	N.	S.E.	S.E.	N.W.	N.W.	S.E.	S.E.
Total precipitation	18.74	7.53	6.88	23.01	7.56	4.47	8.33	13.10	14.00	9.61	7.47
Total velocity of wind	13.452	12.650	13.735	16.092	14.611	11.131	12.294	16.406	13.889	14.003	13.944
Maximum velocity of wind	36	33	39	40	32	36	33	36	44	33	40
Direction at time of maximum velocity	S.E.	N.	S.	S.E.	N.	N.W.	S.	N.W.	S.E.	N.W.	S.E.
Clear days	26	44	39	14	46	52	47	40	42	41	44
Fair days	28	31	17	26	26	30	25	28	29	29	32
Cloudy days	36	15	35	50	18	8	19	23	19	20	15
Foggy days	0	0	6	6	5	4	8	0	7	0	0
Days rain fell	39	23	29	46	30	16	26	28	26	28	33
Snow storms	0	1	1	0	2	3	0	0	0	0	3
Solar halos	0	0	1	1	3	0	3	0	0	1	1
Lunar halos	0	0	3	2	1	0	2	0	1	0	0
Number of light frosts	9	15	11	11	27	19	5	25	8	10	5
Number of killing frosts	12	26	17	0	11	28	25	5	6	15	24
Number of days minimum temperature below 32°	5	17	17	0	5	23	11	4	4	4	15

COMPARATIVE SPRING WEATHER AT SACRAMENTO FROM 1878 TO 1888.

The following table shows the average, highest, lowest, and range of barometer; average, highest, lowest, and range of temperature; average relative humidity and dew point; total precipitation; prevailing directions, total, and maximum velocity of wind, with the direction at time of maximum velocity; total number of clear, fair, and cloudy days, and days that rain fell; solar and lunar halos; light and killing frosts; number of days the maximum temperature was above 90 degrees, and the minimum below 32 degrees:

SPRING OF:	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.
Average barometer	29.94	30.05	30.06	30.01	30.04	30.01	29.97	29.97	30.00	29.96	29.98
Highest barometer	30.39	30.33	30.36	30.41	30.38	30.43	30.30	30.37	30.35	30.27	30.48
Lowest barometer	29.56	29.73	29.55	29.68	29.71	29.62	29.51	29.52	29.63	29.65	29.64
Range of barometer	0.83	0.60	0.81	0.73	0.67	0.81	0.79	0.85	0.72	0.62	0.84
Average temperature	60.5	59.3	55.0	60.4	57.6	58.5	57.9	61.8	56.5	59.7	59.2
Highest temperature	91.0	91.0	86.0	88.8	94.6	98.0	85.0	98.0	94.0	98.0	90.0
Lowest temperature	40.0	38.0	29.0	37.0	34.1	39.8	39.0	39.0	37.7	39.0	37.0
Range of temperature	51.0	53.0	57.0	51.8	60.5	58.2	46.0	59.0	56.3	59.0	53.0
Average humidity	67.1	68.4	66.2	68.4	61.9	68.9	73.3	64.9	71.9	65.3	66.9
Average dew point	------	------	------	------	43.0	47.3	48.8	48.8	46.7	46.8	47.0
Prevailing wind	S.	S.E.	S.E.	S.	N.	S.	S.W.	S.W.	S.W.	N.W.	S.W.
Total precipitation	4.33	8.84	16.66	3.01	6.12	7.22	12.52	0.76	6.83	3.52	3.54
Total velocity of wind	13.962	14.530	19.653	14.966	17.774	15.825	18.168	16.670	17.759	17.211	16.810
Maximum velocity of wind	40	32	36	28	35	34	35	30	37	30	48
Direction at time of maximum velocity	N.	N.	N.	N.	N.	N.W.	S.	N.W.	N.W.	S.E. N.W.	S.E.
Clear days	45	39	49	60	57	54	46	58	50	61	59
Fair days	28	34	24	22	19	26	23	28	30	25	23
Cloudy days	19	19	19	10	16	12	23	6	12	6	10
Days rain fell	21	32	27	16	25	24	27	11	26	17	19
Solar halos	1	1	3	0	1	5	5	0	6	5	2
Lunar halos	0	0	1	0	2	0	3	0	2	0	2
Number of light frosts	2	2	3	5	6	2	10	4	4	3	0
Number of killing frosts	0	0	3	0	0	0	0	0	0	0	0
Number days maximum temperature above 90°	1	1	0	0	2	2	0	4	1	3	0
Number days minimum temperature below 32°	0	0	1	0	0	0	0	0	0	0	0

COMPARATIVE SUMMER WEATHER AT SACRAMENTO FROM 1878 TO 1888.

The tabulated meteorological data below shows the average, highest, lowest, and range of barometer; average, highest, lowest, and range of temperature; prevailing direction, total and maximum velocity of wind, with the direction at the time of maximum velocity; total number of clear, fair, and cloudy days, and number of days upon which rain fell; solar and lunar halos; light and killing frosts; total number of days maximum temperature was above 90°:

SUMMER OF:	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.
Average barometer	29.82	29.82	29.88	29.90	29.90	29.91	29.92	29.87	29.85	29.78	29.88
Highest barometer	30.12	30.08	30.19	30.14	30.10	30.20	30.14	30.12	30.06	30.06	30.21
Lowest barometer	29.63	29.62	29.58	29.70	29.72	29.63	29.73	29.64	29.65	29.50	29.63
Range of barometer	0.49	0.46	0.61	0.44	0.38	0.57	0.41	0.48	0.41	0.56	0.58
Average temperature	72.9	72.9	69.1	68.5	71.1	72.4	69.8	70.1	70.9	69.5	71.6
Highest temperature	100.5	103.0	98.0	98.6	99.8	103.5	100.0	105.0	105.0	100.0	107.5
Lowest temperature	49.0	51.0	49.0	48.0	51.2	49.8	52.9	51.5	51.5	47.0	48.5
Range of temperature	51.5	52.0	49.0	50.6	48.6	53.7	47.1	43.5	53.5	53.0	59.0
Average humidity	54.7	52.7	59.3	56.3	57.0	58.4	63.3	55.8	59.5	59.7	57.2
Average dew point	------	------	------	------	53.8	55.7	56.0	52.2	54.8	53.3	53.0
Prevailing wind	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.
Total precipitation	.00	0.13	sprin.	0.50	0.10	.00	1.45	0.11	.00	sprin.	0.08
Total velocity of wind	13.303	13.645	16.066	16.531	15.449	15.609	16.518	18.474	14.917	16.465	15.625
Maximum velocity of wind	20	26	22	22	28	31	24	25	42	30	36
Direction at time of maximum velocity	N.W.	N.	S.	S.W.	N W.	N.W.	S.W.	S.	N.W.	S.W.	S.W.
Clear days	83	81	85	86	87	89	77	81	91	86	77
Fair days	9	11	7	5	4	3	9	10	1	6	11
Cloudy days	0	0	0	1	1	0	6	1	0	0	4
Days rain fell	0	3	2	3	2	0	8	3	0	1	10
Solar halos	0	0	0	0	1	3	0	2	0	0	8
Lunar halos	0	0	0	0	0	0	0	0	0	0	0
Number days maximum temperature above 90°	30	38	12	16	32	34	21	30	35	31	40

COMPARATIVE AUTUMN WEATHER AT SACRAMENTO FROM 1877 TO 1887.

The comparative weather table below shows the average, highest, lowest, and range of barometer; average, highest, lowest, and range of temperature; average humidity and dew point; total precipitation; prevailing direction; total and maximum velocity of wind, with the direction at time of maximum velocity; total number of clear, fair, and cloudy days, and number of days rain fell; solar and lunar halos; light and killing frosts; number of days maximum temperature was above 90° and the minimum below 32°:

AUTUMN OF:	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.
Average barometer	29.97	29.99	30.00	30.04	30.03	30.02	30.01	30.00	29.93	30.01	29.91
Highest barometer	30.34	30.47	30.41	30.49	30.44	30.45	30.41	30.27	30.27	30.37	30.26
Lowest barometer	29.70	29.68	29.38	29.73	29.61	29.77	29.62	29.62	29.46	29.58	29.60
Range of barometer	0.64	0.79	1.03	0.76	0.83	0.68	0.79	0.65	0.81	0.79	0.66
Average temperature	63.4	62.5	60.9	59.9	58.5	58.8	60.1	60.0	62.8	58.5	63.9
Highest temperature	88.0	92.0	96.0	92.0	96.0	99.6	101.0	93.5	98.5	96.0	100.0
Lowest temperature	37.0	34.0	33.0	27.0	32.0	34.0	29.0	37.7	38.5	32.2	28.0
Range of temperature	51.0	58.0	63.0	65.0	64.0	65.6	72.0	55.8	60.0	63.8	72.0
Average humidity	54.3	54.4	65.2	54.9	58.4	69.6	68.8	69.1	66.3	64.5	54.0
Average dew point	------	------	------	------	42.4	47.5	48.7	49.0	49.2	45.1	44.9
Prevailing direction of wind	S.	N.	S.	N.	N.	N.W.	S.	N. S.E.	S.E.	N.W.	N.W.
Total precipitation	1.80	1.35	2.93	0.05	2.73	6.42	2.48	2.61	11.44	0.89	0.47
Total velocity of wind	10.669	11.269	10.492	11.518	12.993	12.213	10.771	10.659	14.214	10.635	11.866
Maximum velocity of wind	28	32	36	28	24	32	25	27	36	36	33
Direction at time of maximum velocity	N.W.	N.	N.	N.	N.	N.W.	N.W.	N.W.	S.E.	N.W.	N.W.
Clear days	76	71	59	71	73	61	67	75	51	78	74
Fair days	6	16	20	14	15	22	18	13	23	12	13
Cloudy days	9	4	12	6	3	8	6	3	17	1	3
Days rain fell	13	7	13	2	12	16	14	9	25	7	7
Solar halos	0	0	2	2	0	1	0	1	2	1	2
Lunar halos	1	0	2	0	0	0	0	4	0	0	0
Number of light frosts	3	6	5	4	11	26	19	17	3	20	5
Number of killing frosts	0	3	4	12	3	0	6	0	0	2	3
Number days maximum temperature above 90°	12	4	10	4	5	8	8	1	15	9	14
Number days minimum temperature below 32°	0	0	0	8	0	0	2	0	0	0	2

ANNUAL WEATHER SUMMARY AT SACRAMENTO FROM 1878 TO 1887, BOTH YEARS INCLUDED.

The following table shows the average, highest, lowest, and range of barometer; average, highest, lowest, and range of temperature; greatest and least monthly range of temperature; average maximum and minimum temperature, and the mean of the same; average relative humidity and dew point; total yearly precipitation; prevailing direction, total, and maximum velocity of wind, with the direction at time of maximum velocity; total number of clear, fair, cloudy, and foggy days, and the total number of days rain, snow, hail, and sleet fell; total number of earthquakes, snow storms, and storms with thunder and lightning; solar and lunar halos; light and killing frosts; total number of days maximum temperature was above 90°, and the minimum below 32°:

ANNUAL WEATHER REVIEW FOR:	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.
Average barometer	29.95	30.00	30.03	30.03	30.03	30.03	29.99	29.98	29.99	29.98
Highest barometer	30.51	30.68	30.49	30.46	30.52	30.74	30.58	30.43	30.51	30.46
Lowest barometer	29.46	29.38	29.48	29.61	29.71	29.62	29.42	29.46	29.32	29.45
Range of barometer	1.05	1.30	1.01	0.85	0.81	1.12	1.16	0.97	1.19	1.01
Average temperature	61.3	60.3	57.2	59.2	58.5	58.8	58.8	61.2	58.8	59.9
Highest temperature	100.5	103.0	98.0	98.6	99.8	103.5	100.0	105.0	105.0	100.0
Lowest temperature	23.5	25.0	25.0	31.9	27.0	22.0	21.0	34.2	27.5	28.0
Range of temperature	77.0	78.0	73.0	66.7	72.8	81.5	79.0	70.8	77.5	72.0
Greatest monthly range of temperature	50.0	49.0	49.0	46.7	55.2	55.8	46.0	58.0	52.8	58.7
Least monthly range of temperature	21.0	33.7	25.0	27.0	31.6	35.7	30.0	27.0	33.2	35.2
Average maximum temperature	81.5	83.7	80.0	81.6	82.0	84.3	70.0	73.2	71.5	72.9
Average minimum temperature	41.2	41.2	39.9	42.1	40.1	39.8	49.7	51.8	49.1	47.7
Mean of maximum and minimum temperature	61.4	62.4	59.9	61.8	61.0	62.0	59.8	62.5	60.3	60.3
Average range of temperature	40.3	42.5	40.1	39.5	41.9	44.5	38.8	40.7	42.6	46.2
Average humidity	62.2	65.7	64.6	66.7	66.0	69.0	70.7	67.8	70.1	63.7
Average dew point	------	------	------	------	45.7	47.3	48.5	48.8	47.8	46.0
Prevailing direction of wind	S.	S.	S.	S.	S.	S.	S.	S.	S.E.	N.W.
Total precipitation	23.45	22.37	31.99	20.71	18.06	13.48	34.92	20.72	18.17	13.43
Total velocity of wind	52.830	52.214	62.497	57.846	58.874	52.637	62.611	62.405	56.036	61.322
Maximum velocity of wind	40	39	40	32	35	36	36	36	44	40
Direction at time of maximum velocity	N.	S.	S.E.	S.E.	N.	N.W.	N.W.	S.E.	S.E.	S.E.
Total number of clear days	234	208	237	251	249	263	239	227	262	267
Total number of fair days	75	99	59	69	76	76	68	88	76	74
Total number of cloudy days	56	58	70	45	40	26	59	50	27	24
Total number of foggy days	0	4	5	8	1	11	0	0	4	0
Total number of days of precipitation	66	79	70	67	70	54	76	62	57	56
Number of earthquakes	2	0	0	1	0	0	0	2	1	1
Snow storms	0	1	1	0	3	2	0	0	0	0
Thunder and lightning	4	4	3	4	4	2	2	6	3	2
Annual number of solar halos	1	3	6	2	5	8	9	4	8	8
Annual number of lunar halos	0	2	4	2	3	0	9	1	2	0
Annual number of light frosts	18	17	14	34	69	33	31	24	30	18
Annual number of killing frosts	22	27	32	4	12	40	22	0	10	26
Total number of days maximum temperature was above 90°	35	48	16	22	42	44	21	48	40	46
Total number of days minimum temperature was below 32°	15	14	17	1	5	27	13	0	4	9

MEAN AVERAGE WINTER TEMPERATURE IN SACRAMENTO.

The tabulated statement below shows the average temperature for the winter months, and for the season also. The winter seasons, beginning with the season of 1853–54, and ending with the one of 1887–88; giving a mean average for the thirty-five years. Judging from the average temperature for each season, we must conclude that the season of 1879–80 was the coldest, 45.5°; and the warmest that of 1881, 51.0°; the mean average of the thirty-five years being 48.3°:

WINTER SEASON OF—	Mean Temp.—December.	Mean Temp.—January.	Mean Temp.—February.	Mean Winter Temperature.
1853–54	48.0	43.0	51.0	47.3
1854–55	47.9	43.7	52.5	48.0
1855–56	46.0	48.0	52.6	48.9
1856–57	43.9	48.5	50.2	47.5
1857–58	47.4	45.0	52.2	48.2
1858–59	44.5	44.9	50.5	46.6
1859–60	43.5	46.2	49.8	46.5
1860–61	49.3	47.1	52.2	49.5
1861–62	50.9	46.4	47.5	48.3
1862–63	46.4	46.9	48.0	47.1
1863–64	46.5	49.2	53.6	49.8
1864–65	50.2	47.4	49.0	48.9
1865–66	44.1	46.5	63.5	51.4
1866–67	50.2	48.2	47.8	48.7
1867–68	46.8	47.0	50.5	48.1
1868–69	47.0	47.6	49.9	48.2
1869–70	46.5	48.6	51.1	48.7
1870–71	45.5	48.3	49.4	47.7
1871–72	48.7	48.5	53.3	50.2
1872–73	49.0	52.7	48.2	50.0
1873–74	47.7	45.7	49.3	47.6
1874–75	45.0	46.9	52.7	48.2
1875–76	48.0	48.8	50.2	49.0
1876–77	45.5	49.1	55.0	49.9
1877–78	48.6	49.7	51.3	49.9
1878–79	47.2	45.5	55.0	49.2
1879–80	44.0	43.5	46.0	44.5
1880–81	50.3	49.2	53.5	51.0
1881–82	46.2	45.1	46.3	45.9
1882–83	48.2	41.9	46.0	45.4
1883–84	44.2	46.6	46.9	45.9
1884–85	48.8	47.1	54.0	50.0
1885–86	49.1	45.7	53.3	49.4
1886–87	49.2	48.5	44.7	47.5
1887–88	46.9	42.8	52.6	47.4
Totals	1651.2	1639.8	1779.6	1690.4
Averages for 35 years	47.2	46.9	50.8	48.3

MEAN AVERAGE SPRING TEMPERATURE IN SACRAMENTO.

The table below will be found to contain the average temperature for the Spring months, also for the season. The warmest one, as indicated by its average temperature, was 1853, 62.9°; the coldest, 1880, 55.0°; the mean average Spring temperature being 59.4°:

SPRING SEASON OF—	Mean Temp.—March.	Mean Temp.—April.	Mean Temp.—May.	Mean Spring Temperature.
1853	59.8	61.0	68.0	62.9
1854	53.0	60.0	62.0	58.3
1855	54.8	58.1	60.2	57.7
1856	57.0	58.8	63.9	59.9
1857	56.4	63.3	65.5	61.7
1858	53.7	59.8	65.2	59.6
1859	51.5	57.1	63.0	57.2
1860	53.3	57.8	58.5	56.5
1861	55.0	60.6	63.7	59.8
1862	53.6	58.0	61.2	57.6
1863	57.6	59.5	67.1	61.4
1864	56.1	62.1	68.5	62.2
1865	53.6	59.3	70.2	61.0
1866	54.2	61.9	63.1	59.7
1867	50.7	59.7	64.4	58.3
1868	55.0	60.1	64.2	59.8
1869	53.6	59.0	64.2	58.9
1870	53.0	57.0	61.0	57.0
1871	56.0	59.2	61.5	58.9
1872	56.8	57.6	67.0	60.5
1873	56.8	60.0	67.9	61.6
1874	52.9	59.5	64.7	59.0
1875	58.7	63.0	68.1	63.3
1876	54.6	59.5	65.7	59.9
1877	59.0	60.2	64.5	61.2
1878	56.7	59.4	65.5	60.5
1879	57.4	60.3	60.2	59.3
1880	48.8	54.6	61.6	55.0
1881	55.5	60.9	64.8	60.4
1882	53.0	55.8	64.0	57.6
1883	56.9	56.0	62.6	58.5
1884	52.9	56.7	64.0	57.9
1885	59.1	60.6	65.7	61.8
1886	52.1	55.5	62.0	56.5
1887	57.8	58.3	62.9	59.7
1888	53.6	62.3	61.8	59.2
Totals	1980.5	2132.5	2308.4	2140.3
Averages for 36 years	55.0	59.2	64.1	59.4

MEAN AVERAGE SUMMER TEMPERATURE IN SACRAMENTO.

The average temperature in the following table is for the summer months and for the summer season, showing by their average temperature that 1866 was the warmest, 74.8°; and the coldest to have been 1881, 68.5°; the mean average for thirty-six years is 71.6°; the season of 1866 being 3.2° above the mean average, and 1881 3.1° below the mean average for the past thirty-six years:

SUMMER SEASON OF—	Mean Temp.—June.	Mean Temp.—July.	Mean Temp.—August.	Mean Summer Temperature.
1853	77.0	75.0	71.0	74.3
1854	67.0	80.6	69.5	72.4
1855	71.1	72.5	73.0	72.2
1856	71.1	75.1	69.6	71.9
1857	71.9	71.4	71.3	71.5
1858	69.4	70.8	70.6	70.3
1859	74.8	69.1	67.2	70.4
1860	65.6	73.2	73.5	70.8
1861	66.2	73.6	69.7	69.8
1862	69.3	73.2	75.0	72.5
1863	69.1	75.6	70.7	71.8
1864	71.1	74.8	74.7	73.5
1865	73.5	74.0	71.7	73.1
1866	72.2	76.2	76.0	74.8
1867	70.3	73.7	71.7	71.9
1868	69.5	73.8	71.2	71.5
1869	70.8	74.3	71.3	72.1
1870	69.3	71.8	72.6	71.2
1871	70.1	70.2	72.0	70.8
1872	69.2	71.4	73.1	71.6
1873	71.7	73.2	66.3	70.4
1874	70.2	72.8	70.9	71.3
1875	70.6	73.3	72.5	72.1
1876	76.9	74.0	72.8	74.6
1877	72.5	75.0	72.9	73.5
1878	71.8	73.4	73.4	72.9
1879	72.1	71.8	74.7	72.9
1880	66.6	70.9	69.7	69.1
1881	66.2	71.1	68.2	68.5
1882	68.1	73.4	71.9	71.1
1883	72.6	73.1	71.4	72.4
1884	65.8	71.2	72.5	69.8
1885	66.2	71.0	73.0	70.1
1886	69.0	72.0	71.6	70.9
1887	69.1	70.2	69.1	69.5
1888	67.7	71.6	75.4	71.6
Totals	2525.6	3628.3	2581.7	2578.6
Averages for 36 years	70.2	73.0	71.7	71.6

MEAN AVERAGE AUTUMN TEMPERATURE IN SACRAMENTO.

The average temperature for the fall season indicates the fall of 1853 as being the warmest, 69.0°; that of 1881 and 1886 were the coldest, judging from the average temperature, 58.5°. The average mean temperature for thirty-five years past was 61.6°, showing the average of 1853 to have been 7.4° above the mean average, and that of 1881 and 1886 to have been 3.1° below the mean average temperature for the past thirty-five years:

FALL SEASON OF—	Mean Temp.—September.	Mean Temp.—October.	Mean Temp.—November.	Mean Autumn Temperature.
1853	76.0	78.0	53.0	69.0
1854	65.0	60.0	55.0	60.0
1855	68.0	63.0	50.6	60.5
1856	70.9	58.0	52.2	60.4
1857	67.9	61.5	53.2	60.9
1858	68.9	59.5	54.2	60.9
1859	65.9	63.3	54.0	61.1
1860	67.6	59.8	53.5	60.3
1861	67.8	59.9	53.6	60.4
1862	70.4	67.6	53.1	63.7
1863	69.0	62.8	52.7	61.5
1864	69.8	64.5	53.5	62.6
1865	68.8	63.1	56.9	62.9
1866	72.2	65.2	53.8	63.7
1867	68.8	62.7	54.8	62.1
1868	68.3	62.0	53.9	61.4
1869	69.9	63.1	54.0	62.3
1870	68.0	63.6	53.4	61.7
1871	67.4	62.2	50.2	59.9
1872	68.8	58.9	51.2	59.6
1873	69.9	61.4	57.5	62.9
1874	70.7	61.7	53.9	62.1
1875	65.7	69.9	56.7	64.1
1876	70.1	63.5	53.3	62.3
1877	72.8	62.9	54.7	63.5
1878	69.0	62.9	55.5	62.5
1879	70.5	61.5	50.9	61.0
1880	68.0	62.1	49.7	59.9
1881	67.8	56.8	50.8	58.5
1882	68.4	58.4	49.5	58.8
1883	71.6	58.2	50.5	60.1
1884	64.8	59.9	55.3	60.0
1885	69.8	64.3	54.4	62.8
1886	67.9	57.1	50.4	58.5
1887	70.4	66.5	54.7	63.9
Totals	2416.8	2185.8	1864.6	2155.8
Averages for 35 years	69.1	62.5	53.3	61.6

Average Annual and Seasonal Temperature in Sacramento.

The statement below shows the average temperature, for each year, for thirty-five years; spring and summer for thirty-six years, and autumn and winter for thirty-five years. The coldest year, inferring from the average temperature, was that of 1880, 57.2°; the warmest was 1864, 62.8°; the mean average for the past thirty-five years, 60.2°, showing the coldest to have been 3° below the mean average, while the warmest year was that of 1864, when it was 2.6° above the mean average for thirty-five years. By careful study of the table, there will be noticed but a slight difference between the coldest and the warmest year, as compared with a thirty-five years' average, generally not more than 3°. Therefore, we might safely say that the average temperature of any year is not likely to vary more than 3° from 60° either way, between the hottest and coldest year, as compared with the mean average temperature for the past thirty-five years:

Year.	Mean Annual Temperature.	Mean Spring Temperature.	Mean Summer Temperature.	Mean Autumn Temperature.	Mean Winter Temperature.	
1853	62.6	62.9	74.3	69.0	1853–54	47.3
1854	59.5	58.3	72.4	60.0	1854–55	48.0
1855	59.5	57.7	72.2	60.5	1855–56	48.9
1856	60.1	59.9	71.9	60.4	1856–57	47.5
1857	60.7	61.7	71.5	60.9	1857–58	48.2
1858	59.5	59.6	70.3	60.9	1858–59	46.6
1859	58.7	57.2	70.4	61.1	1859–60	46.5
1860	59.0	56.5	70.8	60.3	1860–61	49.5
1861	60.1	59.8	69.8	60.4	1861–62	48.3
1862	62.2	57.6	72.5	63.7	1862–63	47.1
1863	60.3	61.4	71.8	61.5	1863–64	49.8
1864	62.8	62.2	73.5	62.6	1864–65	48.9
1865	61.0	61.0	73.1	62.9	1865–66	51.4
1866	62.1	59.7	74.8	63.7	1866–67	48.7
1867	59.9	58.3	71.9	62.1	1867–68	48.1
1868	60.1	59.8	71.5	61.4	1868–69	48.2
1869	60.4	58.9	72.1	62.3	1869–70	48.7
1870	59.6	57.0	71.2	61.7	1870–71	47.7
1871	59.6	58.9	70.8	59.9	1871–72	50.2
1872	60.4	60.5	71.6	59.6	1872–73	50.0
1873	60.7	61.6	70.4	62.9	1873–74	47.6
1874	59.8	59.0	71.3	62.1	1874–75	48.2
1875	62.5	63.3	72.1	64.1	1875–76	49.0
1876	61.7	59.9	74.6	62.3	1876–77	49.9
1877	61.2	61.2	73.5	63.4	1877–78	49.9
1878	61.3	60.5	72.9	62.5	1878–79	49.2
1879	60.3	59.3	72.9	60.9	1879–80	44.5
1880	57.2	55.0	69.1	59.9	1880–81	51.0
1881	59.2	60.4	68.5	58.5	1881–82	45.9
1882	58.5	57.6	71.1	58.8	1882–83	45.4
1883	58.8	58.5	72.4	60.1	1883–84	45.9
1884	58.8	57.9	69.8	60.0	1884–85	50.0
1885	61.2	61.8	70.1	62.8	1885–86	49.4
1886	58.8	56.5	70.9	58.5	1886–87	47.5
1887	59.9	59.7	69.5	63.9	1887–88	47.4
1888	----------	59.2	71.6	----------	----------	----------
Totals	2106.0	2140.3	2578.6	2155.8	----------	1690.4
Averages for 35 years	60.2	*59.5	*71.6	61.6	----------	48.3

* Average for thirty-six years.

DAILY NORMAL TEMPERATURE FOR SACRAMENTO.

The following table of normal temperatures for each day of each month, at Sacramento, California, as deduced from three daily observations for nine years, from July, 1877, to December, 1885, inclusive, was prepared at the Chief Signal Office, Washington, D. C., by authority of the Chief Signal Officer:

DATE.	*Jan.	*Feb.	*Mar.	*April.	*May.	*June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	44.2	49 4	55.8	57.7	61.6	69.2	72.3	73.1	73.0	62.3	57.2	50.6
2	45.6	49.5	55.5	58.0	61.7	69.2	71.4	74.0	72.4	62.7	55.6	50.6
3	45.3	49.0	54.0	56.5	62.6	68.8	70.8	73.2	72.5	63.6	*56.5	49.6
4	45.5	49.7	53.4	†57.7	61.2	68.5	71.2	71.9	73.4	64.0	55.5	50.2
5	47.2	48.0	54.8	58.0	61.5	69.4	71.4	72.8	71.8	63.7	56.2	50.6
6	45.9	47.6	54.4	58.3	61.6	68.2	71.5	73.7	69.9	62.7	56.6	49.4
7	46.7	46.0	53.9	58.4	61.4	67.9	70.7	73.9	70.3	62.9	56.9	47.7
8	47.6	47.1	53.7	60.1	62.5	67.2	70.5	74.8	71.5	*62.5	56.2	45.9
9	45.8	47.1	53.7	58.8	61.4	67.5	71.0	75.4	70.8	63.0	55.0	46.1
10	45.9	†48.4	53.0	57.6	62.0	66.1	72.8	74.8	70.9	61.8	53.3	46.1
11	43.9	46.8	53.3	57.3	61.4	†65.7	74.4	74.3	69.9	61.1	52.1	46.4
12	42.7	46.2	53.4	56.6	59.4	68.2	75.4	72.5	70.4	58.7	51.7	45.3
13	43.6	48.1	53.2	56.2	59.9	68.5	74.0	72.0	70.8	57.0	52.0	44.7
14	45.7	47.9	54.1	56.8	59.2	68.3	74.1	72.8	70.4	56.6	53.0	45.7
15	44.6	47.3	54.0	46.5	60.4	67.8	71.5	73.3	70.3	58.6	52.3	47.8
16	45.9	48.8	54.8	55.4	60.4	68.4	73.0	*72.1	68.3	58.9	52.5	47.3
17	46.0	48.9	53.5	54.7	61.5	69.3	72.5	71.5	68.0	60.9	50.5	47.3
18	†45.5	49.7	53.4	56.4	64.0	69.2	70.6	72.9	67.6	61.4	50.1	49.2
19	45.4	50.1	54.0	54.4	65.8	68.6	71.0	71.7	67.5	62.2	50.2	48.6
20	45.7	50.3	55.5	55.4	64.7	68.8	72.5	69.5	68.3	61.3	50.5	47.2
21	45.8	51.2	56.2	57.5	64.0	68.4	73.2	69.2	69.6	61.4	51.0	48.7
22	†47.4	51.9	57.0	58.2	63.8	67.2	73.6	69.5	69.5	60.9	50.7	48.7
23	47.4	53.1	56.5	58.3	64.8	69.2	74.5	69.4	67.3	60.5	50.9	48.0
24	48.0	53.4	56.4	60.1	66.3	68.8	73.3	69.3	66.4	61.0	50.4	49.3
25	47.4	54.9	57.0	58.5	66.9	70.5	71.8	69.7	66.4	61.3	48.5	48.2
26	45.8	54.8	56.4	58.1	67.0	71.5	71.3	69.6	66.7	59.7	48.3	47.2
27	46.3	55.0	†58.4	61.0	67.8	70.5	72.7	69.9	67.1	60.0	48.7	46.7
28	47.1	54.7	56.5	62.7	68.5	68.8	72.3	69.5	66.3	59.7	48.9	46.1
29	48.0	------	57.6	62.7	69.0	69.6	71.7	70.1	65.1	59.6	50.1	44.1
30	48.2	------	57.2	52.6	68.9	71.5	72.5	71.7	63.1	58.1	50.4	43.5
31	49.4	------	57.1	------	69.0	------	72.4	72.7	------	55.9	------	42.6
Monthly	46.1	49.9	55.1	58.0	63.6	68.7	72.3	72.0	69.2	60.8	52.4	47.4

*Means for eight years.
†Means for seven years.

MONTHLY NORMAL TEMPERATURE FOR SACRAMENTO.

The following normal temperatures for each month of the year, for Sacramento, from 1853 to 1887, inclusive—periods of thirty-five and thirty-six years. This table gives the general average temperature for each month, and the annual average, which is termed the normal temperature of a place, in this case being Sacramento, and calculated from three daily observations:

NORMAL TEMPERATURE OF THIRTY-FIVE AND THIRTY-SIX YEARS.

	Degrees.		Degrees.
January—thirty-five years	47.0	August—thirty-six years	71.6
February—thirty-five years	50.8	September—thirty-five years	69.1
March—thirty-six years	55.0	October—thirty-five years	62.5
April—thirty-six years	59.2	November—thirty-five years	53.3
May—thirty-six years	64.1	December—thirty-five years	47.2
June—thirty-six years	70.2	Yearly—thirty-five years	60.2
July—thirty-six years	73.0		

	Degrees.
Normal winter temperature of thirty-five years	48.3
Normal spring temperature of thirty-six years	59.4
Normal summer temperature of thirty-six years	71.6
Normal autumn temperature of thirty-five years	61.6
Normal yearly temperature of thirty-five years	60.2

RAINFALL FOR SPRING, SUMMER, AUTUMN, WINTER, AND TOTAL FOR EACH YEAR, AT SACRAMENTO.

The following table gives the rainfall for each season of spring, summer, autumn, and winter; also the total rainfall for each year and for each season. The table shows the annual rainfall for each year, beginning with the year 1850, and the total for each season, beginning with that of 1849–50. The rainfall for the winter seasons begins with the winter of 1849–50, and ends with the winter of 1887–88—making a total of thirty-nine winters:

YEAR.	Rainfall for Spring.	Rainfall for Summer.	Rainfall for Autumn.	Rainfall for Winter.	Annual Rainfall.	Season of—	Inches.
1849			4.00		*16.50	1849–50	36.00
1850	14.50	none	sprinkle	17.80	19.50	1850–51	4.71
1851	3.71	none	3.32	1.00	15.10	1851–52	17.98
1852	6.89	none	6.00	7.77	27.00	1852–53	36.36
1853	11.95	sprinkle	1.50	18.41	19.99	1853–54	20.06
1854	4.96	.31	1.66	13.29	19.83	1854–55	18.62
1855	9.67	.01	.75	7.28	18.56	1855–56	13.76
1856	5.37	.03	.85	7.61	14.26	1856–57	10.46
1857	.68	.35	3.06	8.58	12.91	1857–58	14.99
1858	4.29	.11	3.16	7.53	16.80	1858–59	16.04
1859	3.66	none	6.50	9.21	16.86	1859–60	22.06
1860	10.47	.05	1.15	5.07	19.19	1860–61	16.18
1861	4.39	.69	2.17	9.87	21.38	1861–62	36.10
1862	5.43	.02	.36	27.94	27.44	1862–63	11.59
1863	4.41	none	1.49	6.81	12.20	1863–64	7.79
1864	3.12	.17	6.84	3.09	19.27	1864–65	22.59
1865	2.31	sprinkle	2.99	13.36	11.15	1865–66	17.91
1866	4.75	.12	2.43	10.07	26.52	1866–67	25.32
1867	2.82	none	3.82	20.05	30.03	1867–68	32.79
1868	6.93	sprinkle	.77	22.04	19.50	1868–69	16.64
1869	4.83	.01	2.97	11.03	18.19	1869–70	13.57
1870	4.03	sprinkle	.60	6.57	10.21	1870–71	8.47
1871	2.90	sprinkle	1.43	4.97	19.32	1871–72	24.05
1872	2.83	.02	2.15	19.47	19.17	1872–73	14.19
1873	1.06	.02	1.52	11.08	18.20	1873–74	22.92
1874	4.31	sprinkle	6.11	17.07	17.92	1874–75	17.70
1875	.80	1.10	6.64	9.69	23.31	1875–76	26.31
1876	5.40	.23	3.75	14.26	18.12	1876–77	9.19
1877	1.39	.01	1.80	3.81	8.44	1877–78	24.86
1878	4.33	none	1.35	18.73	23.45	1878–79	17.85
1879	8.84	.13	2.93	7.53	22.37	1879–80	26.47
1880	16.66	sprinkle	.05	6.88	31.99	1880–81	26.57
1881	3.01	.50	2.73	23.01	20.71	1881–82	16.51
1882	6.12	.10	6.42	7.56	18.06	1882–83	18.11
1883	7.22	none	2.48	4.47	13.48	1883–84	24.78
1884	12.52	1.45	2.61	8.33	34.92	1884–85	16.58
1885	.76	.11	11.44	13.10	20.72	1885–86	32.27
1886	6.83	none	.89	14.00	18.17	1886–87	13.97
1887	3.52	sprinkle	.47	9.61	13.43	1887–88	11.56
1888	3.54	.08		7.47			
Totals	211.21	5.62	111.16	435.12	738.67		763.88
Averages	†5.416	†0.144	†2.850	†11.157	‡19.439		†19.587

* Rainfall for September, October, November, and December, 1849.
† Average for 39 years. ‡ Average for 38 years.

HIGHEST, LOWEST, AND AVERAGE TEMPERATURE, WITH PREVAILING WIND, AT SACRAMENTO.

The following table shows the highest, lowest, and average yearly temperature, along with the prevailing direction of wind, for each year. This data is from the records of Dr. Thomas M. Logan, the railroad company, Mr. Samuel H. Gerrish, and the records of the United States Signal Office. The records cover a period of thirty-six years. It shows that a very low temperature is never recorded at this point. Often several years will intervene without the temperature falling to the freezing point. The lowest recorded temperature is 19°, in January, 1854, and January, 1888; the highest 108°, on August 24, 1888. The prevailing direction of wind for the year is usually from the south.

YEAR.	Highest Temperature.	Lowest Temperature.	Average Annual Temperature.	Prevailing Direction of Wind for Each Year.
1853	97	32	62.6	N.W.
1854	102	19	59.5	N.W.
1855	100	25	59.5	N.W.
1856	100	32	60.1	S.E.
1857	98	31	60.7	S.E.
1858	97	29	59.5	S.
1859	96	34	58.7	S.
1860	90	37	59.0	S.
1861	87	36	60.1	S.
1862	94	32	62.2	N.W.
1863	95	34	60.3	N.W.
1864	96	34	62.8	S.E.
1865	94	31	61.0	S.E.
1866	98	33	62.1	S.E.
1867	99	28	59.9	S.
1868	100	30	60.1	S.
1869	102	31	60.4	S.
1870	106	21	59.6	S.
1871	102	30	59.6	S.
1872	100	26	60.4	N.
1873	105	31	60.7	S.
1874	96	33	59.8	S.
1875	100	33	62.5	S.
1876	98	30	61.7	S.
1877	103	31	61.2	S.
1878	101	24	61.3	S.
1879	103	25	60.3	S.
1880	98	25	57.2	S.
1881	99	32	59.2	S.
1882	100	27	58.5	S.
1883	104	22	58.8	S.
1884	100	21	58.8	S.
1885	105	34	61.2	S.
1886	105	28	58.8	S.E.
1887	100	28	59.9	N.W.
1888	*108	19	------------	S.

* Up to September 1, 1888.

Highest temperature in 36 years, 108°—on August 24, 1888.
Lowest temperature in 36 years, 19°—in January, 1854, and 19° in January, 1888.
Average annual temperature for 35 years, 60.2°.
General prevailing direction of wind—from the south.

Rainfall of Sacramento from September, 1849, to September, 1888.

The following table of rainfall, from September, 1849, to September 1, 1888, was collected from the records of Dr. T. M. Logan, Dr. F. W. Hatch, and those of the United States Signal Service:

Year.	January	February	March	April	May	June	July	August	September	October	November	December	Total for Year	Season of	Inches
1849	------	------	------	------	------	------	------	------	.25	1.50	2.25	12.50	------	1849–50	36.00
1850	4.50	.50	10.00	4.25	.25	none	none	none	none	none	sprin.	sprin.	19.50	1850–51	4.71
1851	.65	.35	1.88	1.14	.69	none	none	none	1.00	.18	2.14	7.07	15.10	1851–52	17.98
1852	.58	.12	6.40	.19	.30	none	none	none	sprin.	none	6.00	13.41	27.00	1852–53	36.36
1853	3.00	2.00	7.00	3.50	1.45	sprin.	sprin.	none	sprin.	sprin.	1.50	1.54	19.99	1853–54	20.06
1854	3.25	8.50	3.25	1.50	.21	.31	none	sprin.	sprin.	1.01	.65	1.15	19.83	1854–55	18.62
1855	2.67	3.46	4.20	4.32	1.15	.01	none	none	sprin.	none	.75	2.00	18.56	1855–56	13.76
1856	4.92	.69	1.40	2.13	1.84	.03	none	none	sprin.	.20	.65	2.40	14.26	1856–57	10.46
1857	1.38	4.80	.68	sprin.	sprin.	.35	none	sprin.	none	.66	2.41	2.63	12.91	1857–58	15.00
1858	2.44	2.46	2.88	1.21	.20	.10	.01	sprin.	sprin.	3.01	.15	4.34	16.80	1858–59	16.03
1859	.96	3.91	1.64	.98	1.04	none	none	none	.02	none	6.48	1.83	16.86	1859–60	22.09
1860	2.31	.93	5.11	2.87	2.49	.02	.63	none	.06	.91	.18	4.28	19.19	1860–61	16.10
1861	2.67	2.92	3.32	.48	.59	.14	.55	none	none	sprin.	2.17	8.64	21.38	1861–62	35.56
1862	15.04	4.26	2.80	.82	1.81	.01	none	.01	none	.36	sprin.	2.33	27.44	1862–63	11.58
1863	1.73	2.75	2.36	1.69	.36	none	none	none	sprin.	none	1.49	1.82	12.20	1663–64	7.87
1864	1.08	.19	1.30	1.08	.74	.09	none	.08	sprin.	.12	6.72	7.87	19.27	1864–65	22.51
1865	4.78	.71	.48	1.37	.46	none	sprin.	none	.08	.48	2.43	.36	11.15	1865–66	17.93
1866	7.70	2.01	2.02	.48	2.25	.10	.02	none	none	sprin.	2.43	9.51	26.52	1866–67	25.30
1867	3.44	7.10	1.01	1.80	.01	none	none	none	.01	none	3.81	12.85	30.03	1867–68	32.79
1868	6.04	3.15	4.35	2.31	.27	sprin.	none	none	none	none	.77	2.61	19.50	1868–69	16.64
1869	4.79	3.63	2.94	1.24	.65	.01	none	none	sprin.	2.12	.85	1.96	18.19	1869–70	13.57
1870	1.37	3.24	1.64	2.12	.27	sprin.	sprin.	sprin.	none	.02	.58	.97	10.21	1870–71	8.47
1871	2.08	1.92	.69	1.45	.76	sprin.	none	none	sprin.	.21	1.22	10.59	18.92	1871–72	23.65
1872	4.04	4.74	1.94	.61	.28	.02	none	none	sprin.	.22	1.93	5.39	19.17	1872–73	14.21
1873	1.23	4.36	.55	.51	none	sprin.	.02	sprin.	none	.31	1.21	10.01	18.20	1873–74	22.90
1874	5.20	1.86	3.05	.89	.37	sprin.	sprin.	none	.05	2.26	3.80	.44	17.92	1874–75	17.70
1875	8.70	.55	.80	sprin.	sprin.	1.10	none	none	none	.44	6.20	5.52	23.31	1875–76	26.53
1876	4.99	3.75	4.15	1.10	.15	none	.21	.02	sprin.	3.45	.30	none	18.12	1876–77	8.96
1877	2.77	1.04	.56	.19	.64	.01	sprin.	sprin.	none	.73	1.07	1.43	8.44	1877–78	24.86
1878	9.26	8.04	3.09	1.07	.17	none	none	none	.29	.55	.51	.47	23.45	1878–79	17.85
1879	3.18	3.88	4.88	2.66	1.30	.13	sprin.	sprin.	none	.88	2.05	3.41	22.37	1879–80	26.47
1880	1.64	1.83	1.70	14.20	.76	none	sprin.	none	none	none	.05	11.81	31.99	1880–81	26.57
1881	6.14	5.06	1.37	1.64	sprin.	.50	sprin.	none	.30	.55	1.88	3.27	20.71	1881–82	16.51
1882	1.89	2.40	3.78	1.99	.35	.10	sprin.	none	.57	2.63	3.22	1.13	18.06	1882–83	18.11
1883	2.23	1.11	3.70	.67	2.85	none	none	none	.90	.96	.61	.44	13.48	1883–84	24.78
1884	3.43	4.46	8.14	4.32	.06	1.45	none	sprin.	.60	2.01	none	10.45	34.92	1884–85	16.58
1885	2.16	.49	.08	.68	sprin.	.11	sprin.	none	.08	.02	11.34	5.76	20.72	1885–86	32.27
1886	7.95	.29	2.68	4.08	.07	none	none	none	none	.68	.21	2.21	18.17	1886–87	13.97
1887	1.12	6.28	.94	2.53	sprin.	none	none	sprin.	.02	none	.45	2.09	13.43	1887–88	7.94
1888	4.81	.57	3.04	.10	.40	.08	sprin.	none	------	------	------	------	------	1888–89	*sprin
Totals	148.12	110.31	111.80	74.17	26.19	4.67	1.14	.11	4.23	26.48	80.46	176.49	738.67	--------	763.88
Av'ges	3.798	2.828	4.867	1.902	0.672	0.120	0.029	.003	.108	.690	2.063	4.525	19.439	--------	19.587

* Up to September 1, 1888.

MONTHLY AND ANNUAL MEAN TEMPERATURES

(In degrees Fahrenheit) at Points in California, during Year ending June 30, 1887.

Prepared by Sergeant Nelson Gorom, Observer Signal Corps, San Francisco, California.

Place.	1886.						1887.						Mean.
	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	
Almaden	-----	-----	-----	-----	55.7	51.4	50.7	47.1	56.5	56.5	62.6	68.2	56.4
Anaheim	72.3	76.6	71.5	66.1	60.5	56.9	54.0	53.3	58.9	61.0	63.4	65.8	63.3
Antioch	78.3	74.5	67.6	62.2	52.6	52.4	49.8	47.1	59.0	62.3	68.2	73.6	62.4
Aptos	61.4	61.9	60.9	55.1	51.6	53.1	49.1	47.0	55.5	55.7	58.9	63.4	56.5
Athlone	78.8	82.0	75.0	67.6	57.9	53.2	50.5	45.8	58.9	62.1	71.4	78.7	65.7
Auburn	76.7	77.5	70.5	55.2	47.9	48.1	44.9	39.8	54.5	55.4	63.1	71.3	58.1
Bishop Creek	89.9	88.1	81.1	60.5	48.7	49.5	44.7	41.5	62.5	63.9	72.1	82.6	65.2
Boca	62.7	62.7	54.8	45.0	28.4	34.1	27.4	21.4	34.3	42.9	51.8	56.4	43.3
Bordeau	85.7	86.4	77.1	60.8	48.5	46.5	47.2	46.9	59.0	61.8	72.9	79.2	64.8
Brentwood	82.4	80.9	69.3	62.8	52.6	50.5	49.2	46.7	60.8	64.3	67.8	77.9	63.7
Brighton	81.4	81.4	74.9	65.5	52.6	53.8	50.9	47.6	59.5	62.3	68.8	77.9	64.0
Byron	85.6	82.2	75.8	64.0	52.7	51.2	48.1	46.8	62.5	65.3	74.5	83.7	66.1
Caliente	84.7	85.6	73.4	67.1	53.7	55.0	50.4	47.5	59.0	58.7	68.1	77.6	65.3
Calistoga	73.1	71.6	68.2	58.4	49.5	50.6	47.5	43.3	55.7	59.5	63.6	70.2	59.2
Chico	89.1	85.1	77.9	62.5	52.9	52.6	50.5	45.0	60.0	65.0	72.7	80.6	66.3
Chualar	66.2	66.0	64.7	60.8	56.0	54.0	-----	51.0	60.0	59.6	64.7	-----	60.3
Cisco	62.4	60.5	54.6	40.1	34.7	35.4	29.5	24.4	36.4	38.6	47.9	55.3	43.0
Colfax	72.6	76.1	71.3	54.7	49.5	48.8	45.0	36.8	54.7	54.4	62.3	69.5	58.9
Colton	87.7	86.1	79.1	64.2	59.1	63.0	56.8	51.1	64.3	60.3	68.4	74.8	67.1
Corning	81.4	79.7	73.6	66.0	50.2	51.6	48.7	44.0	55.7	59.8	68.7	78.3	63.1
Davis	80.4	76.2	68.1	60.4	54.2	53.1	50.2	47.6	61.1	62.1	68.7	75.4	63.1
Delano	88.0	87.5	78.3	62.2	48.6	52.0	46.4	48.5	58.4	66.3	74.7	82.7	66.1
Delta	77.3	76.1	72.5	51.8	47.5	45.8	41.2	34.9	50.8	52.6	64.1	70.4	57.6
Dunnigan	84.5	81.2	76.5	64.5	52.3	51.7	51.0	46.1	63.6	64.6	71.7	79.7	65.6
Elmira	84.4	85.4	77.5	65.9	55.9	54.5	53.8	47.5	59.9	63.2	66.6	73.0	65.5
Emigrant Gap	65.3	66.9	64.0	46.2	44.3	44.4	38.6	30.8	43.8	45.9	53.8	61.5	50.5
Eureka	-----	-----	-----	-----	-----	-----	47.0	41.4	49.3	48.5	51.9	52.7	48.7
Farmington	80.4	77.2	72.8	61.8	52.3	50.9	45.9	46.1	61.8	60.5	67.6	74.8	62.5
Fort Bidwell	68.2	69.6	60.2	44.6	33.6	38.4	32.5	24.5	43 6	43.5	53.8	57.7	47.0
Fresno	84.2	85.6	77.4	61.0	57.4	50.9	47.8	49.3	62.7	63.6	72.4	79.6	66.9
Galt	78.0	76.3	70.1	58.6	50.2	49.5	50.5	45.4	60.5	58.6	75.4	81.7	62.1
Gilroy	72.5	71.5	65.3	57.9	51.5	53.2	47.7	46.8	56.5	56.9	62.4	66.6	59.0
Goshen	88.9	88.7	77.5	61.4	48.3	47.4	46.1	47.1	63.7	64.3	73.2	85.6	66.3
Hollister	71.3	73.3	68.3	63.3	53.8	52.1	51.9	49.0	59.8	59.4	65.5	68.0	61.3
Indio	96.5	90 6	83.9	74.4	63.4	62.2	54.1	59.5	76.6	72.8	79.4	90.0	75.3
Ione	77.5	76.0	67.4	54.7	47.1	49.8	44.8	44.9	54.9	57.6	63.7	73.4	59.2
Kings City	-----	-----	-----	62.0	53.8	52.7	49.7	44.6	61.4	58.9	65.6	66.4	57.1
Keeler	79.9	81.5	74.1	58.2	45.1	44.7	43.1	40.0	56.5	57.4	66.7	74.0	60.4
Keene	80.9	80.8	73.7	58.5	52.2	49.1	45.6	41.5	52.0	50.7	60.5	67.1	59.2
Kingsbury	83.6	83.5	73.2	56.4	46.2	45.9	44.3	45.4	59.6	61.1	69.5	77.4	62.4
Knights Landing	81.7	79.9	71.2	60.9	53.8	56.3	54.8	45.8	48.3	53.1	61.3	69.1	61.7
Lathrop	74.6	75.4	68.2	57.3	47.7	48.9	46.4	44.6	56.9	57.9	65.7	72.8	59.8
Lemoore	80.2	82.1	70.5	57.7	45.6	49.8	46.9	49.3	62.9	61.0	69.6	78.1	62.9
Livermore	70.1	72.4	68.5	61.6	53.3	55.2	52.1	45.7	57.3	56.1	60.5	65.9	59.3
Livingston	89.6	91.4	81.9	66.8	63.0	57.4	53.6	52.9	66.1	65.5	73.9	81.2	70.1
Los Angeles	69.7	71.8	65.6	59.3	56.6	55.7	55.4	51.6	59.1	59.1	63.1	66.1	61.7
Mammoth Tank	102.9	102.3	96.7	77.2	62.3	60.8	57.7	58.0	78.4	80.4	91.2	100.2	80.7
Martinez	68.2	68.6	62.6	51.9	49.2	48.7	48.0	44.6	53.6	57.1	60.8	67.5	56.4
Marysville	76.0	76.6	79.0	66.0	61.9	50.8	48.5	42.5	54.9	57.9	71.4	75.6	63.7
Menlo Park	66.5	65.4	61.1	55.5	48.7	50.5	46.4	47.1	55.8	55.4	61.0	66.5	56.0
Merced	81.8	82.0	74.9	61.8	54.2	54.6	49.0	46.8	62.9	62.1	71.7	78.1	65.7
Modesto	86.9	87.3	74.3	61.1	49.8	50.1	46.6	46.1	59.7	63.8	72.5	78.1	64.8
Mojave	84.6	74.6	75.7	59.2	47.1	48.9	46.5	42.3	62.5	67.4	77.9	78.8	63.2
Monterey	60.2	60.3	59.1	54.8	50.8	52.0	49.4	48.3	54.0	53.3	58.4	62.0	55.4
Napa	-----	67.1	58.7	55.1	49.6	50.1	48.8	45.2	53.5	57.9	62.0	72.7	56.6
Newhall	85.7	85.9	70.6	59.4	50.5	53.2	49.0	46.4	56.7	58.6	63.6	71.1	62.2
Niles	71.5	71.4	65.5	56.2	50.2	48.6	46.6	46.8	57.0	56.8	63.4	64.5	58.1
Oakland	62.5	62.1	61.5	56.7	53.6	53.4	51.5	47.7	53.5	56.0	57.5	60.5	56.3
Orland	86.9	85.9	79.3	62.6	54.4	53.5	53.4	45.3	59.4	59.6	69.2	77.8	65.4
Pajaro	63.5	64.2	63.4	57.1	55.5	56.3	51.5	48.4	56.1	54.9	58.2	61.9	57.6
Paso Robles	-----	-----	-----	-----	49.7	49.9	44.3	45.3	54.5	57.9	64.7	70.6	54.6
Petaluma	67.0	68.2	64.9	60.5	54.2	53.8	51.9	49.1	57.5	57.8	65.5	71.7	60.6
Pleasanton	73.7	76.1	70.8	60.5	53.3	53.4	51.6	47.9	57.8	59.5	64.4	69.3	61.2
Red Bluff	82.9	81.5	75.6	60.7	51.3	50.0	48.7	43.4	58.9	60.2	68.8	77.1	63.5

Monthly and Annual Mean Temperatures—Continued.

Place.	1886.						1887.						Mean.
	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	
Redding	84.6	85.7	79.5	63.7	50.3	48.7	48.6	42.7	59.0	61.6	72.9	76.4	64.5
Rocklin	79.6	76.8	69.7	59.6	51.8	50.5	49.6	47.4	56.3	59.6	66.3	72.1	61.6
Sacramento	72.0	71.6	67.9	57.1	50.4	49.2	48.5	44.7	57.8	58.3	62.9	69.1	59.1
Salinas	62.7	66.1	63.5	56.5	49.2	51.8	47.7	45.2	55.1	54.6	60.5	64.2	56.4
San Ardo	-----	-----	70.0	61.6	51.5	50.5	48.0	46.7	56.8	57.7	63.7	67.7	57.4
San Diego	67.1	70.5	66.6	59.7	56.0	56.0	54.2	52.9	57.2	59.0	62.1	64.6	60.5
San Fernando	84.3	83.8	77.6	67.3	64.4	60.2	57.1	54.7	64.9	70.6	74.9	77.1	69.7
San Francisco	59.1	58.5	60.5	57.1	55.1	53.1	51.8	47.0	54.3	54.5	55.8	58.0	55.4
San Gorgonio	69.1	79.1	71.6	58.9	52.8	50.5	48.8	45.2	58.6	57.5	64.2	72.8	60.8
San José	66.3	66.7	63.7	57.3	52.3	52.4	50 3	48.2	54.8	54.3	58.6	63.9	57.4
San Mateo	68.4	67.5	65.1	59.2	54.0	54.1	50.3	47.0	55.1	57.2	60.6	64.9	58.6
San Miguel	-----	-----	-----	56.6	46.8	46.9	48.0	46.3	57.4	56.8	64.5	69.9	54.8
Santa Cruz	66.6	65.0	59.7	56.7	55.7	54.9	52.2	49.3	58.2	57.7	59.7	63.9	58.3
Santa Monica	66.7	69.3	66.5	61.4	58.5	52.4	50.6	48.7	53.2	55.1	62.1	65.1	59.1
Selma	85.9	83.3	75.2	62.6	49.5	47.8	45.2	47.1	60.0	66.3	73.0	79.4	64.6
Soledad	66.7	68.5	67.2	56.5	50.1	51.9	46.4	45.2	57.3	55.7	59.8	66.0	57.6
Soquel	62.6	61.3	61.3	51.2	51.4	59.0	47.7	49.9	58.5	58.2	58.6	58.8	56.5
South Side	76.1	78.6	75.0	58.5	52.2	53.4	48.6	43.2	57.1	55.6	-----	-----	59.8
South Vallejo	72.4	71.7	69.3	61.3	55.6	54.6	53.1	49.4	60.3	62.7	65.3	68.3	62.0
Spadra	70.9	71.9	66.5	53.2	54.8	56.7	54.2	51.6	61.8	59.4	66.9	69.5	61.4
Stockton	74.6	73.1	68.2	59.0	51.0	50.9	48.5	45.9	58.0	59.5	64.0	68.2	60.1
Suisun	72.7	72.4	69.7	61.3	52.5	53.4	51.7	48.5	59.9	61.0	64.7	68.8	61.4
Summit	58.9	59.8	54.7	39.8	31.2	34.9	28.4	22.3	35.0	35.2	43.7	52.4	41.4
Sumner	88.2	83.8	72.8	56.5	46.7	49.5	46.4	50.1	63.1	65.3	75.7	85.2	65.3
Tehama	81.0	80.5	74.1	58.7	50.7	49.1	49.0	44.8	57.7	56.9	63.6	73.4	61.6
Tehachapi	79.9	77.7	66.9	50.7	42.4	44.3	37.4	33.3	49.7	49.9	56.2	63.9	54.4
Templeton	-----	-----	-----	-----	44.8	48.0	46.1	47.1	59.1	61.7	67.6	71.2	55.7
Towles	71.7	69.8	67.1	54.1	49.7	51.9	46.5	34.5	52.2	50.6	55.3	62.1	55.5
Tracy	84.1	81.4	73.5	63.8	53.2	52.1	50.9	54.6	62.1	65.0	66.2	75.4	65.2
Traver	81.4	81.5	72.9	56.8	47.8	50.0	46.2	47.0	62.5	64.3	-----	83.0	63.0
Truckee	64.9	61.8	52.3	39.1	32.0	35.9	29.1	24.0	38.2	38.5	50.0	57.5	43.6
Tulare	83.7	87.3	78.1	64.8	49.5	50.7	47.1	48.1	58.8	64.4	69.3	79.1	65.1
Turlock	81.6	82.6	74.1	61.2	55.4	55.4	51.7	52.6	61.7	66.4	73.8	77.5	66.2
Williams	85.8	82.7	75.7	66.6	49.5	52.6	48.6	44.4	59.9	63.9	74.0	78.9	65.2
Willows	82.7	83.1	80.0	64.2	52.9	51.0	50.0	45.7	60.2	64.7	73.1	80.0	65.6
Woodland	80.2	78.6	71.7	55.5	53.3	51.1	49.2	47.6	60.8	62.0	70.0	81.6	63.5

MONTHLY AND ANNUAL MEAN TEMPERATURES

(*In degrees Fahrenheit*) *at Points in California during Year ending June 30, 1888.*

Prepared by SERGEANT NELSON GOROM, Observer Signal Corps, San Francisco, California.

PLACE.	1887.						1888.						Mean.
	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	
Almaden	68.8	67.1	69.5	65.6	56.1	50.7	46.6	54.2	54.5	61.2	62.3	68.6	60.4
Anaheim	72.3	71.2	71.7	70.6	61.4	53.8	55.6	58.5	59.5	66.9	67.9	73.5	65.2
Antioch	74.8	73.6	73.3	68.4	57.0	49.2	44.6	52.6	54.0	60.0	65.9	67.9	61.8
Aptos	61.0	60.1	60.1	59.6	54.5	49.2	46.0	51.9	53.0	58.4	59.7	67.9	56.8
Athlone	83.2	79.4	75.3	67.1	54.9	45.5	43.4	52.2	54.8	67.6	71.9	76.4	64.3
Auburn	76.0	72.5	71.0	67.1	53.4	44.8	40.4	50.9	51.3	61.4	61.0	66.9	59.7
Beaumont	77.9	77.2	74.1	66.2	60.7	47.3	41.5	51.3	48.2	62.0	62.7	69.9	61.6
Bishop Creek	87.6	82.0	76.9	64.9	50.0	44.3	33.4	50.9	56.3	69.6	78.1	86.0	65.0
Boca	64.9	63.5	55.9	49.6	33.5	22.4	15.8	27.6	33.4	42.5	53.4	58.4	43.4
Borden	81.4	79.2	76.5	68.3	55.3	46.6	43.8	51.7	54.7	69.5	70.5	75.4	64.4
Brentwood	80.3	79.6	75.9	63.5	52.8	47.2	42.2	51.3	57.8	67.6	75.6	77.8	64.3
Brighton	79.9	76.2	76.8	70.4	57.7	49.5	45.4	54.5	55.3	66.9	69.1	74.6	64.7
Byron	84.8	76.5	74.5	-----	54.5	48.3	41.8	56.5	59.4	69.2	69.5	78.2	64.8
Caliente	86.0	83.1	74.3	68.2	56.6	46.8	47.0	55.4	53.3	67.9	74.1	-----	64.8
Calistoga	70.9	65.8	67.4	65.5	51.8	49.4	44.4	53.7	55.1	60.3	58.5	64.8	59.0
Chico	88.3	80.1	77.7	70.5	55.2	48.5	42.6	54.9	56.4	70.9	71.6	75.1	66.0
Cisco	60.4	57.9	55.8	51.9	41.3	32.1	27.8	33.0	34.8	44.8	48.2	51.1	44.9
Coles	-----	-----	-----	-----	-----	-----	40.8	40.6	39.9	51.6	53.0	58.0	47.3
Colfax	75.5	71.7	69.0	65.9	53.9	42.4	37.8	47.8	49.0	60.4	61.2	65.4	58.3
Colton	78.5	76.9	73.8	65.6	57.0	49.3	47.7	55.6	62.0	65.0	69.0	73.2	64.5
Corning	87.3	70.1	75.7	70.1	54.0	48.2	39.9	49.0	50.1	69.5	71.4	72.6	64.0
Davis	74.4	74.1	70.6	69.0	55.5	49.0	43.4	50.7	53.1	65.1	66.8	69.9	61.8
Delano	91.0	88.2	85.0	72.0	64.9	50.7	44.2	49.0	50.2	66.6	70.9	76.3	67.4
Delta	73.9	----	72.7	61.0	47.7	39.4	33.7	45.8	44.4	62.3	66.4	67.4	55.9
Dunnigan	79.3	77.8	73.8	67.9	56.8	48.8	45.0	57.2	61.8	71.5	73.1	79.0	66.0
Dunsmuir	-----	-----	-----	-----	-----	-----	-----	-----	43.8	53.9	51.0	52.8	-----
Elmira	71.8	71.4	72.8	68.6	55.4	49.8	44.6	54.4	56.6	64.4	65.4	73.1	62.4
Emigrant Gap	68.0	66.9	61.9	57.9	47.1	38.4	32.3	40.1	38.7	53.9	53.0	54.7	51.1
Eureka	52.5	54.5	53.4	52.3	50.6	47.5	44.6	48.1	47.7	50.9	53.0	58.8	51.2
Farmington	77.8	75.4	74.1	69.2	61.3	45.8	44.5	53.1	54.5	66.3	66.5	72.8	63.4
Fort Bidwell	67.9	65.7	59.2	51.0	39.6	31.3	21.8	36.6	36.6	51.6	53.8	55.6	47.6
Fresno	87.5	82.6	75.2	68.5	56.3	46.3	44.1	53.2	54.1	67.1	68.6	74.0	64.8
Galt	79.8	77.9	76.4	63.4	60.8	52.1	46.8	47.5	53.1	68.2	68.7	72.7	64.0
Gilroy	65.0	63.7	67.9	64.1	52.7	46.3	44.8	51.1	52.3	62.0	61.8	71.9	58.6
Goshen	88.7	85.3	82.4	71.3	57.5	44.4	44.6	54.1	56.9	70.9	74.6	80.7	67.6
Hollister	64.9	62.4	65.0	62.1	56.1	52.2	47.6	54.3	54.9	60.9	61.3	67.9	59.1
Hornbrook	-----	75.3	68.8	57.3	44.7	35.0	22.0	41.3	47.0	58.5	63.9	66.0	52.7
Indio	95.7	94.7	87.9	74.9	62.9	54.1	47.8	60.3	62.3	75.6	74.2	89.7	73.3
Ione	76.3	75.6	71.9	61.1	50.6	45.1	42.6	50.6	50.5	61.3	65.4	75.1	60.5
Kings City	69.4	64.8	64.8	62.4	54.6	44.4	44.2	48.2	47.1	55.3	63.9	68.7	57.3
Keeler	81.1	79.7	72.3	63.4	52.2	42.9	35.3	47.8	50.6	63.4	66.5	73.9	60.8
Keene	75.5	64.2	64.7	62.5	55.0	43.4	41.1	47.5	50.5	60.7	63.5	68.3	58.1
Kingsburg	84.5	80 7	75.7	64.3	52.3	43.0	41.3	48.5	52.7	70.2	67.9	74.7	63.0
Knights Landing	73.7	72.8	67.5	65.7	56.8	46.3	41.3	50.5	51.0	60.3	66.3	67.2	60.0
Lathrop	74.9	71.9	70.3	63.2	52.1	46.6	44.9	52.6	53.3	64.3	65.7	72.6	61.0
Lemoore	84.0	79.8	73.7	70.9	55.4	45.0	43.8	50.6	53.6	66.8	65.2	74.6	63.7
Livermore	66.3	66.4	67.1	66.4	57.3	52.5	46.9	53.7	53.7	59.9	58.8	64.0	59.4
Livingston	84.8	79.1	79.1	70.2	60.9	49.6	48.2	56.4	57.8	68.3	70.6	74.9	66.7
Los Angeles	69.5	68.5	68.2	68.5	60.0	53.7	50.0	54.4	55.1	61.9	60.8	67.5	61.5
Mammoth Tank	100.5	90.4	88.4	80.4	65.8	51.0	49.6	59.4	63.0	82.0	82.6	93.4	75.5
Martinez	66.7	61.3	62.9	62.4	54.2	50.3	44.0	53.1	49.7	58.9	58.6	70.7	57.7
Marysville	74.1	71.3	69.4	67.1	58.6	53.3	54.5	57.5	63.9	70.4	70.2	78.8	65.8
Menlo Park	64.2	63.6	64.6	60.8	53.6	48.3	45.8	52.5	51.4	59.0	60.4	67.0	57.6
Merced	82.5	68.5	74.6	72.0	58.8	49.4	47.1	54.6	54.2	65.9	69.3	76.3	64.4
Modesto	79.3	78.0	74.2	65.8	53.0	44.9	44.2	50.8	54.4	66.2	66.1	73.4	62.5
Mojave	84.9	82.9	77.6	71.5	60.0	50.1	43.7	52.1	53.7	71.0	67.6	73.1	65.7
Montague	-----	-----	-----	-----	-----	-----	-----	49.8	49.9	61.9	65.4	65.6	58.5
Monterey	61.6	62.1	62.6	61.4	57.5	53.3	49.7	54.8	54.6	57.5	60.0	64.8	58.3
Napa	68.1	65.3	64.3	61.6	51.5	48.6	44.6	49.5	51.8	56.4	60.7	69.8	57.7
Newhall	75.6	72.2	72.4	65.6	55.8	46.5	45.5	50.9	54.9	65.1	64.0	71.5	61.7
Niles	63.2	60.3	63.6	64.6	62.7	-----	-----	50.5	54.8	61.7	63.9	-----	60.6
Oakland	58.2	59.0	61.0	61.7	52.9	51.3	47.4	52.6	51.0	57.6	57.0	62.9	56.0
Orland	84.9	81.2	77.4	71.9	61.0	50.5	44.5	54.8	53.9	69.0	70.7	75.3	66.3
Pajaro	60.2	58.6	61.4	61.6	53.8	51.0	47.1	53.1	52.1	56.0	58.3	63.1	56.4

MONTHLY AND ANNUAL MEAN TEMPERATURES—Continued.

PLACE.	1887.						1888.						Mean.
	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	
Paso Robles	72.5	69.0	69.3	61.7	52.4	46.7	41.1	47.8	51.9	62.3	64.0	71.7	59.2
Petaluma	66.9	65.1	66.0	66.0	54.7	52.5	44.2	50.8	49.0	57.3	57.8	61.2	57.6
Pleasanton	70.4	68.3	68.3	65.1	53.8	51.3	48.1	53.7	54.9	61.8	63.4	69.8	60.7
Red Bluff	83.9	81.3	76.4	71.1	55.2	48.2	40.9	53.9	54.5	67.0	68.1	70.7	64.3
Redding	79.8	76.8	71.3	70.5	56.0	45.6	39.2	52.4	55.3	69.6	74.2	72.5	63.6
Rocklin	76.6	73.0	72.5	67.1	53.4	46.6	42.7	49.8	52.5	59.7	64.0	70.2	52.3
Sacramento	70.2	69.1	70.4	66.5	54.7	46.9	42.8	52.6	53.6	62.3	61.8	67.7	59.9
Salinas	60.1	59.3	60.3	61.1	51.3	45.8	44.1	49.7	48.6	56.2	58.1	68.4	55.2
San Ardo	68.2	68.4	67.4	63.1	52.8	46.4	44.6	50.8	52.0	60.0	62.7	70.1	58.9
San Diego	66.4	66.2	65.7	64.5	59.2	54.6	51.6	54.9	55.8	60.8	61.2	65.9	60.6
San Fernando	78.9	80.4	-----	70.0	67.1	54.3	44.6	52.4	55.6	69.5	62.1	75.1	64.5
San Francisco	55.2	56.3	60.4	62.9	55.2	51.7	46.3	52.8	52.5	56.2	55.4	61.0	55.5
San José	64.8	63.3	64.7	62.5	54.6	50.5	46.4	52.6	52.8	58.3	59.8	65.2	58.0
San Mateo	63.6	63.6	64.3	64.4	51.2	50.1	46.5	51.2	51.7	58.3	58.2	67.1	57.5
San Miguel	73.7	69.9	68.5	67.0	59.3	49.5	43.2	52.5	54.5	61.2	62.2	69.5	60.9
Santa Barbara	-----	-----	-----	-----	-----	49.8	48.4	56.1	54.8	62.6	62.8	70.7	57.9
Santa Cruz	61.9	62.3	65.1	64.4	55.7	53.0	49.2	53.1	54.8	59.3	59.3	67.5	58.8
Santa Monica	66.9	65.8	63.3	67.1	63.9	59.3	56.8	58.0	57.2	65.3	64.0	68.0	63.0
Selma	84.9	81.8	75.7	68.6	57.3	45.1	43.6	50.4	51.7	63.1	70.7	77.2	64.2
Sims	-----	-----	-----	-----	-----	-----	-----	-----	53.7	66.1	72.4	71.7	66.0
Sisson	-----	-----	-----	-----	-----	-----	-----	-----	43.4	60.3	45.4	57.1	51.6
Soledad	63.1	61.1	63.3	60.7	50.1	45.4	42.1	50.4	50.5	59.2	57.6	63.6	55.6
Soquel	59.1	58.0	56.1	64.6	58.4	52.1	50.3	52.2	53.6	59.6	61.0	68.4	57.8
South Side	77.0	75.5	73.9	67.7	59.1	50.7	46.0	52.3	51.5	63.5	61.5	70.0	62.4
South Vallejo	67.3	66.5	67.6	65.3	60.3	49.9	44.4	-----	53.4	57.0	57.8	63.7	59.4
Spadra	70.7	77.6	68.3	64.2	58.3	50.8	49.1	52.2	51.0	61.8	62.7	70.8	61.5
Stockton	70.3	68.4	68.5	63.9	53.4	46.7	44.3	51.1	53.6	62.3	62.0	68.1	59.4
Suisun	68.2	69.4	71.6	67.6	56.8	48.3	44.7	51.9	56.9	63.5	61.7	68.3	60.7
Summit	59.2	57.4	53.7	49.5	39.7	26.7	22.4	30.9	30.5	40.7	45.9	50.1	42.2
Sumner	91.7	85.8	80.8	68.5	57.3	47.6	46.5	54.9	57.7	73.5	75.7	83.2	68.6
Tehama	77.9	72.5	75.1	67.5	57.5	46.5	41.1	54.6	54.7	65.9	65.4	68.6	62.3
Tehachapi	73.7	71.0	64.4	56.8	46.5	39.0	32.9	41.3	46.2	54.7	61.4	-----	53.4
Templeton	73.3	69.7	68.9	65.2	55.1	47.8	46.0	54.0	54.4	61.8	61.2	69.8	60.6
Towles	68.1	65.3	64.8	63.3	54.6	46.1	34.5	46.4	49.3	53.9	60.9	55.0	55.2
Tracy	81.3	76.3	73.4	67.6	56.8	49.2	47.6	51.4	52.5	65.4	68.3	72.6	63.5
Traver	84.6	79.1	74.1	-----	-----	46.5	-----	-----	54.8	65.2	76.4	83.0	70.5
Tropico	-----	-----	-----	-----	-----	47.3	48.3	52.7	55.7	64.3	65.7	71.8	58.0
Truckee	62.9	60.0	52.1	46.4	37.8	25.1	20.2	29.6	33.6	46.5	51.6	56.0	43.5
Tulare	84.8	80.8	78.6	71.6	58.1	43.3	44.0	51.5	57.0	73.0	75.0	80.5	66.5
Turlock	80.0	73.5	74.4	69.2	55.8	48.1	45.7	53.2	55.9	64.6	67.0	74.1	63.5
Williams	83.1	81.2	75.4	72.7	59.4	51.8	46.1	53.4	52.6	64.1	68.9	79.0	65.6
Willows	86.3	87.0	78.4	71.7	56.0	46.3	40.3	51.1	51.6	64.1	67.2	70.9	64.2
Woodland	82.8	78.6	77.1	78.1	68.1	51.9	43.2	46.1	48.1	51.7	62.5	67.3	63.0

SEASONAL RAINFALL

Prepared in the Office of the Officer in Charge of the Pacific Coast Division Signal Ser-

STATIONS.	July, 1886	Aug., 1886	Sept., 1886	Oct., 1886	Nov., 1886	Dec., 1886	Jan., 1887	Feb., 1887	March, 1887
Almaden, Santa Clara Co.	.—	.—	.—	.—	0.80	.—	1.52	8.68	0.92
Anaheim, Los Angeles Co.	.00	T.	.00	.00	0.33	T.	0.43	5.71	.00
Aptos, Santa Cruz Co.	.00	.00	.00	0.70	0.84	1.53	0.95	8.82	0.76
Auburn, Placer Co.	.00	.00	.00	0.89	1.26	4.88	2.04	12.38	1.50
Athlone, Merced Co.	.00	.00	.00	0.32	0.92	0.69	0.38	3.52	0.23
Antioch, Contra Costa Co.	.00	.00	.00	0.40	T.	1.02	0.38	3.87	0.49
Battle Mountain, Lander Co., Nev.	0.38	.00	0.18	1.20	1.50	0.44	0.73	1.15	0.30
Benson, Cochise Co., A. T.	1.44	2.68	0.17	0.25	.00	0.19	.00	0.34	.00
Beowawe, Eureka Co., Nev.	0.25	.00	.00	1.20	0.80	0.68	0.20	1.20	.00
Bishop, Inyo Co.	.00	.00	.00	.00	.00	0.20	0.65	1.58	.00
Blue Creek, Box Elder Co., Utah	0.88	0.55	0.91	0.85	1.05	0.28	0.75	0.78	0 30
Boca, Nevada Co.	.—	.00	0.10	0.70	0.70	0.70	2.40	12.70	.00
Borden, Fresno Co.	.00	.00	.00	0.38	0.65	0.57	0.25	2.24	0.30
Brentwood, Contra Costa Co.	.00	.00	.00	0.15	0.24	0.87	0.38	5.05	0.61
Browns, Humboldt Co., Nev.	.00	.00	.00	0.62	0.10	0.47	T.	1.29	0.25
Brighton, Sacramento Co.	.00	.00	.00	0.85	0.12	1.47	0.80	4.87	1.08
Byron, Contra Costa Co.	.00	.00	.00	0.89	.00	0.95	0.48	4.43	0.19
Caliente, Kern Co.	T.	.00	.00	T.	1 45	1.33	0.38	2.79	0.07
Calistoga, Napa Co.	.00	.00	.00	1.25	.00	3.95	2.22	11.18	1.58
Carlin, Elko Co., Nev.	0.08	.00	.00	0.24	0.85	0.85	0.61	2.00	0.14
Casa Grande, Pinal Co., A. T.	0.33	1.40	.00	.00	0.35	.00	.00	0.40	.00
Cisco, Placer Co.	.00	.00	.00	1.45	1.00	6.10	4.90	22.85	0.80
Chico, Butte Co.	.00	.00	.00	0.97	0.15	2.78	0.68	6.53	1.38
Colfax, Placer Co.	.00	.00	.00	1.96	0.46	6.12	2.99	9.24	1.31
Corinne, Box Elder Co., Utah	0.65	0.15	1.75	1.50	1.40	0.25	0.88	1.35	0.70
Corning, Tehama Co.	.00	.00	.00	0.30	.00	2.01	0.45	6.81	1.46
Chualar, Monterey Co.	.00	.00	.00	0.15	0.70	0.40	.—	2.50	0.60
Colton, San Bernardino Co.	.00	.00	.00	.00	0.80	.00	0.21	3.64	.00
Davisville, Yolo Co.	.00	.00	.00	0.48	.00	1.81	0.99	6.14	0.78
Delta, Shasta Co.	.00	.00	T.	1.30	0.30	8.81	3.84	10.27	3.37
Delano, Kern Co.	.00	.00	.00	T.	0.69	0.34	0.20	2.63	.00
Deming, Grant Co., N. M.	1.13	4.19	4.36	0.50	.00	.00	.00	0.20	.00
Dunnigan, Yolo Co.	.00	.00	.00	0.51	T.	1.91	0.97	6.93	1.13
Elko, Elko Co., Nev.	.00	.00	.00	0.20	0.60	.—	0.02	1.60	.00
Elmira, Solano Co.	.00	.00	.00	0.28	.00	2.74	1.01	7.10	0.55
Emigrant Gap, Placer Co.	.00	.00	.00	2.96	0.40	8.00	4.12	18.80	2.03
Farmington, San Joaquin Co.	.00	.00	.00	0.27	0.89	1.37	0.36	3.37	0.29
Fresno, Fresno Co.	.00	.00	.00	0.47	0.70	0.34	0.31	2.80	0.09
Galt, Sacramento Co.	.00	.00	.00	0.92	0.85	1.76	0.61	5.35	1.11
Gilroy, Santa Clara Co.	.00	.00	.00	0.78	0.33	1.09	0.90	5.14	0.82
Golconda, Humboldt Co.	0.42	.00	.00	0.91	0.21	0.25	0.08	1.15	T.
Goshen, Tulare Co.	.00	.00	.00	0.10	0.55	0.69	0.35	2.26	0.56
Halleck, Elko Co., Nev.	.00	.00	.00	1.19	0.80	0.20	0.30	1.85	.00
Hawthorn, Esmeralda Co., Nev.	T.	.00	.00	.00	.00	.—	T.	1.85	.00
Hollister, San Benito Co.	.00	.00	.00	0.38	0.42	0.54	0.57	3.63	0.55
Hot Springs, Churchhill Co., Nev.	.00	.00	.00	0.46	0.50	T.	0.12	1.80	.00
Humboldt, Humboldt Co., Nev.	T.	.00	.00	0.10	0.60	0.24	.00	1.25	.00
Indio, San Diego Co.	.00	.00	.00	.00	0.12	.00	.00	0.93	.00
Ione, Amador Co.	.00	.00	.00	1.20	0.70	0.64	0.83	7.26	1.55
Keeler, Inyo Co.	0.14	0.08	.00	0.01	0.08	.00	T.	0.75	.00
Keene, Kern Co.	T.	0.02	.00	T.	1.95	1.10	0.51	3.20	0.92
Kelton, Box Elder Co., Utah	1.22	0.44	0.35	0.58	1.25	0.32	0.04	0.48	0.03
Kingsburg, Fresno Co.	.00	.00	.00	0.20	0.58	0.43	0.36	2.48	0.13
Kings City, Monterey Co.	.—	.—	.—	0.14	0.36	0.03	0.38	5.08	0.18
Knights Landing, Yolo Co.	.00	.00	.00	0.23	.00	1.60	1.00	6.60	0.75
Lathrop, San Joaquin Co.	.00	.00	.00	0.21	0.83	0.40	0.21	2.84	0.14
Lemoore, Fresno Co.	T.	.00	.00	0.25	0.30	0.15	0.23	2.19	0.10
Livermore, Alameda Co.	0.40	.00	.00	0.30	0.70	0.81	0.90	6.23	0.23
Livingston, Merced Co.	.00	.00	.00	0.16	0.53	0.46	0.37	2.41	0.43
Lordsburg, Grant Co., N. M.	1.54	1.65	1.17	0.17	0.20	.00	.00	0.12	.00
Mammoth Tank, San Diego Co.	.00	0.01	.00	0 01	.00	0.24	.00	1.38	.00
Maricopa, Pinal Co., A. T.	.00	0.75	.00	1.00	.00	.00	.00	0.57	.00
Martinez, Contra Costa Co.	0.07	.00	.00	0.35	0.58	1.29	0.94	7.46	0.56
Marysville, Yuba Co.	.00	.00	.00	0.63	T.	2.20	0.73	6.09	1.02

"T"—Trace of precipitation. Too small to be measured.

FOR 1886, 1887, 1888.

vice, U. S. A., by Francis Chreighton, Observer Signal Corps, San Francisco, California.

April, 1887	May, 1887	June, 1887	July, 1887	Aug., 1887	Sept., 1887	Oct., 1887	Nov., 1887	Dec., 1887	Jan., 1888	Feb., 1888	March, 1888	April, 1888	May, 1888	June, 1888
1.60	.00	.00	.00	.00	0.20	0.05	0.78	4.44	4.51	1.24	4.73	0.32	0.64	0.16
2.21	T.	.00	.00	.00	T.	0.75	0.92	2.16	6.29	0.92	5.32	T.	.00	.00
1.61	0.19	.00	.00	.00	0.47	0.05	1.11	3.72	5.85	1.59	3.25	0.50	0.79	0.25
4.34	0.30	.00	.00	T.	1.09	.00	1.22	7.90	7.07	1.40	1.70	0.80	0.40	1.55
1.62	.00	0.23	.00	.00	0.58	.00	0.23	1.11	2.29	.00	2.05	0.30	0.60	.00
0.95	.00	.00	.00	.00	0.41	.00	0.29	2.30	2.84	1.24	5.90	.00	0.50	.00
1.24	0.14	0.50	0.12	0.18	.—	.00	0.10	1.50	3.12	0.30	0.25	0.35	1.50	0.51
T.	0.08	.00	1.49	2.39	2.92	0.45	0.37	0.15	0.04	.00	0.30	.00	0.37	.00
0.07	.00	.00	.00	.00	.00	.00	0.50	0.20	1.10	0.10	.00	0.15	0.35	0.59
0.35	0.55	0.35	.00	.00	0.15	0.15	0.05	1.10	1.37	0.47	0.92	0.05	.00	0.35
0.65	0.05	0.10	0.10	.00	0.40	.00	0.30	0.70	2.10	0.15	0.55	0.45	0.10	0.05
1.80	T.	.—	.—	T.	.—	.00	0.30	.—	3.75	1.10	2.40	0.40	0.51	0.10
2.37	.00	.00	.00	.00	0.46	0.05	0.28	0.78	0.93	0.17	1.98	0.11	0.47	.00
1.61	.00	.00	.00	.00	0.50	.00	0.40	2.62	4.24	0.40	2.28	0.02	0.59	.00
0.50	1.10	0.20	.00	0.15	0.25	.00	.00	.—	0.40	0.35	.00	0.20	0.38	0.08
1.98	.00	.00	.00	.00	.00	.00	0.57	2.70	4.67	0.62	2.86	0.30	0.59	.—
1.21	.00	.00	.00	.00	.00	T.	0.42	2.90	2.67	1.25	1.77	.00	0.75	.00
2.66	0.21	.00	.00	.00	.00	0.63	0.05	1.43	.—	1.14	1.50	.00	0.81	.—
2.82	T.	.00	.00	.00	0.18	.00	1.50	4.82	7.87	2.87	5.64	0.26	0.20	1.16
1.62	0.08	0.13	0.35	0.01	0.10	.00	0.20	0.70	2.20	0.20	.00	0.50	1.00	0.25
0.30	0.20	0.40	1.07	0.97	1.99	0.95	1.28	0.15	0.61	.00	0.45	.00	.—	.00
3.95	0.40	.00	T.	.00	0.15	.00	1.60	8.80	9.75	2.72	6.10	0.20	1.50	1.90
2.31	.00	0.96	.00	.00	.00	.00	1.05	2.53	4.95	1.15	1.94	0.15	.00	1.20
4.92	0.72	.00	.00	.00	0.68	0.84	1.61	6.00	13.28	2.18	2 80	0.95	0.17	2.60
1.70	0.35	0.30	0.35	0.25	0.15	.00	0.18	1.10	2.70	0.75	1.35	1.10	0.30	0.40
2.86	0.28	0.18	.00	.00	.00	.00	1.37	3.70	3.64	2.09	3.20	0.19	0.40	0.79
1.15	0.03	.—	.—	.—	.—	.—	.—	.—	.—	.—	.—	.—	.—	.—
1.94	T.	.00	.00	.00	.00	.00	.—	0.80	.—	.—	3.68	0.43	.00	.00
2.03	.00	.00	.00	.00	0.05	.00	0.50	2.52	4.14	1.10	2.80	0.30	0.50	.00
5.53	1.26	0.82	.00	.00	.00	.00	0.75	2.23	10.45	4.67	1.70	.00	2.45	3.30
1.44	0.68	.00	.00	.00	.00	.00	0.03	0.60	2.21	.—	0.94	.00	0.15	.00
.00	.00	.00	2.02	3.46	3.39	2.13	0.31	0.05	0.26	.—	0.24	0.50	0.70	0.50
2.41	.00	.00	.00	.00	.00	.00	0.83	3.30	4.18	1.03	3.39	.00	1.62	.00
0.70	.00	0.23	0.40	0.10	0.15	.00	0.20	0.98	1.08	0.20	0.64	0.80	1.21	.00
2.06	.00	.00	.00	.00	.00	.00	0.76	3.41	4.81	1.49	3.92	T.	0.45	0.19
6.17	1.02	1.14	.00	0.13	0.05	3.00	1.50	7.70	17.05	3.92	5.42	3.30	2.33	3.04
2.89	.00	T.	.00	.00	0.39	T.	0.20	2.32	3.82	0.15	3.52	0.07	0.92	.00
2.65	0.03	0.02	.00	.00	0.52	0.29	0.27	0.67	1.84	0.10	1.99	0.15	0.48	.00
2.56	.00	.00	.00	.00	0.15	.00	0.38	3.27	3.97	0.46	3.14	0.40	0.39	.00
2.05	.00	.00	.00	.00	0.43	.00	1.15	4.32	5.35	0.77	3.92	0.40	0.44	.00
0.60	0.07	0.85	.00	.00	.00	.00	0.10	0.30	0.70	.—	.00	0.95	1.25	0.45
2.85	1.10	.00	.00	.00	0.50	0.17	0.12	1,18	2.11	0.19	1.33	0.12	0.29	.00
0.18	0.12	.00	0.25	0.10	0.40	.00	0.60	0.90	0.85	0.25	0.10	0.88	0.67	0.70
0.08	T.	1.13	0.25	.00	0.30	.00	0.10	0.42	2.38	0.26	0.30	.—	1.20	.—
1.32	0.04	0.02	.00	.00	0.43	.00	0.60	1.54	3.61	0.97	2.75	0.40	0.80	0.02
.00	.00	0.12	T.	.00	.00	.00	.00	0.15	0.60	0.20	0.05	0.05	0.21	.00
.00	.00	1.30	.00	0.20	.00	.00	.00	0.50	0.60	.—	T.	0.25	0.20	.00
0.30	.00	.00	.00	T.	0.05	0.15	.00	.00	0.75	.00	.00	.00	.00	.00
1.44	0.10	.00	.00	.00	0.67	.00	0.25	3.17	4.60	0.58	1.16	0.70	0.22	.00
1.18	0.04	T.	0.52	.00	1.05	0.84	0.01	.—	0.70	1.21	0.30	0.12	0.30	0.20
2.73	T.	0.20	T.	.00	0.12	1.32	0.50	1.72	1.30	1.70	2.69	0.78	2.03	.00
1.57	.00	0.33	1.32	0.25	0.10	.00	0.40	0.60	1.50	0.35	0.70	0.30	0.20	1.13
2.10	0.42	.00	.00	.00	0.53	.00	0.15	1.16	2.29	0.29	1.64	.00	0.21	.00
0.58	0.02	0.09	.00	.00	0.06	0.05	0.31	1.99	2.85	0.70	2.76	0.10	0.01	.00
2.30	.00	.00	.00	.00	.00	.00	0.57	3.26	4.18	0.91	2.51	0.07	0.43	0.34
1.25	.00	.00	.00	.00	.00	.00	0.30	2.27	2.46	0.41	1.09	0.49	.—	.00
2.07	1.03	0.12	.00	.00	0.15	0.33	0.33	0.90	1.89	.00	1.28	.00	0.88	.00
1.60	.00	.00	.00	.00	0.80	.00	0.61	3.51	3.20	0.94	2.54	0.60	0.66	0.30
1.46	.00	.00	.00	.00	0.17	.00	0.11	1.81	2.79	0.29	2.07	0.26	0.22	.00
.00	0.10	0.30	3.17	2.67	1.31	.00	0.32	0.70	0.44	0.10	0.88	.00	.00	0.28
0.13	.00	.00	.00	.00	0.33	0.03	0.20	0.05	0.05	0.07	0.05	0.03	0.01	.00
0.05	0.25	.00	.—	.—	.—	0.28	1.13	.00	.00	0.12	0.48	.00	.00	.00
1.94	.00	.00	.00	.00	0.33	.00	0.30	0.95	4.24	1.65	3.54	.00	0.10	0.15
1.90	0.10	0.09	.00	.00	.00	.00	1.07	3.70	4.58	.—	2 55	.00	0.41	0.32

SEASONAL RAIN

STATIONS.	July, 1886	Aug., 1886	Sept., 1886	Oct., 1886	Nov., 1886	Dec., 1886	Jan., 1887	Feb., 1887	March, 1887
Menlo Park, San Mateo Co.	0.24	.00	.00	0.86	0.40	1.26	0.72	4.92	0.46
Merced, Merced Co.	.00	.00	.00	0.47	0.25	0.58	0.13	2.83	0.20
Modesto, Stanislaus Co.	.00	.00	.00	0.25	1.01	0.65	0 09	2.16	0.34
Mojave, Kern Co.	T.	.00	.00	T.	0.76	0.08	T.	4.09	.00
Monterey, Monterey Co.	.00	.00	.00	0.70	0.78	0.60	0.35	4.92	0.60
Napa, Napa Co.	.00	.00	.00	1.16	0.11	2.58	1.87	10.68	0.67
Newhall, Los Angeles Co.	.00	.00	.00	.00	0.87	0.21	.00	12.38	0.15
Niles, Alameda Co.	.00	.00	.00	0.57	1.27	1.15	1.20	9.44	0.83
Arcata, Humboldt Co.	.00	.00	.00	3.19	1.77	9.03	9.43	8.73	2.65
Carson City, Ormsby Co., Nev.	1.25	.00	0.30	0.21	0.44	0.72	1.01	3.27	0.23
Crescent City, Del Norte Co.	1.02	0.04	0.12	5.12	1.26	19.28	17.94	9.41	7.24
Berkeley, Alameda Co.	—	—	—	—	—	3.93	1.66	9.44	0.98
Denverton, Solano Co.	.00	T.	.00	1.27	0.27	1.51	0.83	5.64	0.81
Downey, Los Angeles Co.	.00	0.38	.00	.00	0.72	0.08	0.02	5.64	0.04
Evergreen	—	—	—	—	—	0.96	0.79	6.13	0.75
Elsinore, San Diego Co.	—	—	—	—	—	0.09	0.16	7.01	0.06
Folsom, Sacramento Co.	.00	.00	.00	1.34	0.55	3.35	1.27	9.21	1.30
Fouts Springs, Colusa Co.	.00	.00	.00	0.70	0.20	2.83	2.00	7.88	2.12
Fort Jones, Siskiyou Co.	2.13	0.85	.00	1.86	0.80	6.62	5.28	4.95	1.07
Grass Valley, Nevada Co.	—	—	—	—	—	1.96	—	16.53	1.69
Jolon, Monterey Co.	.00	.00	.00	0.35	0.48	0.61	0.57	8.52	0.38
La Grange, Stanislaus Co.	.00	.00	.00	0.22	1.20	0.75	0.51	5.11	0.04
Los Banos, Merced Co.	.00	.00	.00	0.42	0.18	0.21	0.06	1.50	0.44
Lugonia, San Bernardino Co.	.00	.00	.00	0.07	1.13	0.07	0.09	5.05	0.19
Nordhoff, Ventura Co.	.00	.00	.00	0.36	1.10	0.76	0.22	16.81	0.44
Poway, San Diego Co.	T.	0.02	.00	0.10	1.50	0.20	0.09	4.87	0.34
Sonoma, Sonoma Co.	T.	.00	T.	0.95	0.27	2.36	1.94	11.77	0.91
Santa Clara, Santa Clara Co.	.00	.00	0.01	0.06	7.58	—	—	6.94	0.70
Shingle Springs, El Dorado Co.	.00	.00	.00	1.66	0.93	3.50	1.67	12.21	1.45
Upper Mattole, Humboldt Co.	—	—	—	—	—	17.88	1.61	11.91	3.34
Vichy Springs, Mendocino Co.	—	—	—	—	—	—	2.17	7.59	1.60
Vacaville, Solano Co.	—	—	—	—	—	2.39	1.61	8.44	1.17
Wheatland, Yuba Co.	—	—	—	—	—	1.83	0.94	5.37	1.33
Santa Maria, Santa Barbara Co.	.00	.00	.00	0.06	0.59	0.72	0.50	5.95	0.25
Point Conception	—	9.17	—	0.04	0.48	—	0.20	4.92	—
Año Neuvo Island	—	—	—	1.45	0.75	1.95	1.36	6.16	0.39
Pigeon Point	—	—	—	1.65	0.35	0.72	0.87	5.86	0.18
Point Mentora	0.09	—	—	1.80	0.46	2.26	1.96	8.14	0.78
Farallone Islands	—	—	0.50	1.15	0.55	1.40	0.80	7.52	0.45
Point Benito	—	—	—	1.56	0.70	2.53	1.56	10.41	1.22
Yerba Buena Island	—	—	0.02	1.35	0.48	1.82	0.81	6.89	0.50
East Brother Island	—	—	—	0.36	0.08	1.07	0.17	3.01	0.16
Point Reyes	0.13	—	—	0.55	1.45	1.76	0.35	3.90	0.53
Point Arena	—	—	—	1.07	0.55	4.68	3.07	5.04	1.69
Crescent City	—	—	—	4.09	—	12.60	12.90	7.68	4.63
Humboldt	0 02	—	—	2.23	0.85	8.19	7.32	7.11	2.32
Orland, Colusa Co.	.00	.00	.00	0.50	T.	1.77	0.33	3.74	1.63
Ogden, Weber Co., Utah	.00	0.42	1.23	1.97	1.72	0.59	1.80	2.28	0.49
Oakland, Alameda Co.	0.08	.00	.00	1.60	0.25	2.96	1.31	8.01	0.65
Otego, Elko Co., Nevada	.00	0.36	0.17	1.66	0.45	0.51	1.07	1.70	0.35
Pajaro, Monterey Co.	.00	.00	.00	0.85	0.60	1.24	1.57	5.95	0.61
Palisade, Eureka Co. Nevada	.00	.00	0.10	0.40	1.25	0.37	0.45	2.12	.00
Pantano, Pima Co., Arizona	1.00	2.54	2.24	0.46	0.50	.00	.00	1.15	.00
Paso Robles, San Luis Obispo Co.	—	—	—	—	0.37	0.69	0.51	6.14	0.34
Petaluma, Sonoma Co.	.00	.00	0.02	0.69	0.57	1.21	1.25	10.43	0.79
Pleasanton, Alameda Co.	.00	.00	.00	0.39	0.73	0.87	0.79	5.93	0.68
Redding, Shasta Co.	.00	.00	.00	0.98	0.13	5.34	2.50	8.35	1.20
Red Bluff, Tehama Co.	.00	.00	.00	1.92	0.47	4.06	0.62	5.10	1.30
Reno, Washoe Co., Nevada	0.15	.00	.00	0.02	0.35	0.30	0.60	2.90	.00
Rocklin, Placer Co.	.00	.00	.00	1.04	0.97	2.43	0.75	6.77	1.80
Salinas, Monterey Co.	.00	.00	.00	0.59	0.80	0.85	0.78	4.62	0.63
San Ardo, Monterey Co.	.00	.00	.00	.00	0.35	0.17	0.58	5.58	0.17
Santa Cruz, Santa Cruz Co.	.00	.00	.00	0.79	1.10	2.20	1.01	9.62	0.53
San Fernando, Los Angeles Co.	0.19	T.	.00	0.78	0.87	0.24	0.21	8.54	0.27
San Gorgonio, S. Buenav'tura Co.	.00	.00	.00	.00	0.58	0.08	0.06	5.07	0.08
San José, Santa Clara Co.	0.03	.00	.00	0.49	0.73	0.71	0.68	6.81	0.63

"T"—Trace of precipitation. Too small to be measured.

FALL—Continued.

April, 1887	May, 1887	June, 1887	July, 1887	Aug., 1887	Sept., 1887	Oct., 1887	Nov., 1887	Dec., 1887	Jan., 1888	Feb., 1888	March, 1888	April, 1888	May, 1888	June, 1888
1.18	0.01	.00	.00	.00	0.22	.00	0.85	2.16	3.17	1.36	2.31	0.02	0.37	0.09
1.74	.00	.00	.00	.00	0.45	.00	0.10	1.00	2.67	0.15	1.68	0.28	0.65	0.10
1.22	.00	.00	.00	.00	0.05	.00	0.10	1.76	1.72	0.53	1.36	0.25	0.69	0.10
0.14	.00	.00	.00	.00	.00	0.95	0.50	1.00	2.62	1.50	1.75	.00	.00	.00
1.16	.00	0.05	.00	.00	0.25	.00	1.35	1.81	3.95	1.09	3.29	0.23	0.81	.00
2.27	0.17	.00	.00	.00	.00	.00	1.35	4.18	4.87	.—	4.18	0.65	0.88	.00
1.96	0.10	0.03	.00	.00	0.02	0.65	1.46	4.26	6.74	1.17	4.21	0.29	0.04	.00
1.27	0.07	.00	.00	.00	0.54	.00	0.93	.—	.—	.—	2.83	0.23	0.60	.—
6.49	2.65	1.96	.00	.00	0.46	0.44	3.40	7.47	11.36	2.57	2.77	1.37	.—	.—
0.65	0.46	0.46	0.23	.00	0.11	0.04	T.	2.08	1.51	0.22	0.54	0.18	1.05	0.08
5.65	4.64	1.20	.00	T.	0.08	1.08	5.79	16.66	22.40	3.52	5.86	.—	1.04	.—
2.53	0.06	0.04	T.	.00	0.39	.00	0.76	2.95	5.84	1.92	4.50	T.	0.42	0.50
2.17	0.06	.00	.00	.00	0.19	.00	0.54	3.06	3.57	1.56	3.18	0.04	0.43	.—
2.31	0.08	0.07	.00	.00	0.28	0.41	0.45	2.46	5.33	0.22	6.32	0.11	0.02	.00
0.08	0.07	.00	.00	.00	0.32	.00	0.83	2.47	2.61	1.44	3.32	0.08	0.81	0.24
1.54	0.02	T.	T.	.00	0.16	0.32	1.72	4.04	6.09	0.30	5.87	0.08	0.09	.00
2.48	0.03	0.22	.00	T.	0.38	.00	0.59	4.82	5.83	0.84	3.08	0.12	0.35	0.27
4.36	T.	T.	T.	.00	T.	.00	0.12	7.85	10.83	0.70	5.00	.—	3.35	0.65
2.63	0.94	0.36	0.37	0.17	0.35	0.09	1.75	3.88	6.18	1.77	2.43	0.08	1.80	4.21
6.54	0.64	0.52	.00	.00	0.26	.00	1.38	6.65	12.44	2.46	5.22	0.58	0.78	2.26
1.11	0.40	T.	.00	.00	0.21	0.21	0.94	4.42	5.64	0.16	4.81	.00	0.37	0.01
2.82	.00	.00	.00	T.	0.37	T.	0.20	2.15	2.84	0.06	2.63	0.02	0.52	T.
0.43	.00	T.	.00	.00	T.	.00	0.05	0.74	1.83	0.06	1.33	.00	0.19	T.
2.38	0.20	0.30	.00	.00	.00	0.70	4.00	3.19	4.80	2.00	3.25	0.38	.—	.—
1.88	0.18	.00	.00	.00	0.11	0.89	1.63	5.29	7.46	1.28	5.49	0.54	0.26	.—
2.01	0.34	.00	.00	T.	0.62	.00	2.04	2.70	4.01	0.89	4.85	0.10	0.51	.—
.00	T.	.00	.00	.00	0.25	.00	2.08	4.97	5.78	0.70	4.55	0.19	1.42	0.73
1.22	.00	.00	.00	.00	0.41	0.04	0.69	2.45	3.08	1.68	3.10	0.12	1.28	0.18
6.24	0.06	.00	.00	.00	0.49	T.	1.08	6.18	8.22	1.08	4.22	0.43	0.18	0.31
9.80	3.01	0.59	.00	.00	0.09	0.18	6.44	11.24	41.63	4.13	8.69	1.51	0.48	.—
.00	.00	.00	.00	.00	0.33	.00	1.40	4.40	9.55	2.01	4.45	0.06	0.21	1.29
2.81	0.11	.00	.00	.00	0.26	.00	1.06	4.32	6.93	9.55	4.23	0.13	0.52	0.19
2.15	0.10	0.57	.00	T.	0.06	.00	0.50	2.01	4.13	1.06	2.42	0.16	0.38	0.35
1.07	0.22	T.	T.	.00	0.30	.00	1.09	2.69	4.62	0.43	1.90	0.12	0.14	T.
0.55	.—	.—	.—	.—	.—	.—	1.88	3.03	6.49	0.60	3.65	.—	.—	.—
1.57	3.30	0.03	.—	.—	0.25	.—	1.73	5.40	7.22	0.84	4.72	0.08	0.98	0.30
1.58	.—	.—	.—	.—	0.05	.—	1.34	1.91	5.49	1.04	3.80	.—	1.52	0.26
1.54	0.16	.—	.—	.—	0.21	.—	1.45	2.79	5.63	1.56	4.59	0.01	0.43	0.53
1.55	.—	.—	.—	.—	0.90	.—	0.60	2.52	3.20	0.53	2.59	.—	0.05	0.16
2.06	.—	0.31	.—	.—	0.40	.—	1.11	3.12	6.96	1.46	3.85	0.28	0.63	0.45
1.60	.—	.—	.—	.—	0.22	.—	0.60	2.23	5.10	1.29	2.92	.—	0.41	0.05
0.32	0.02	.—	.—	.—	0.28	.—	0.10	0.94	2.15	0.24	0.87	.—	0.05	0.06
1.00	0.05	.—	.—	.—	.—	.—	0.45	0.43	.—	.—	.—	.—	.—	.—
3.20	0.62	0.21	.—	.—	0.07	.—	2.31	3.68	11.41	1.29	2.95	0.25	0.75	2.70
6.69	.—	.—	.—	.—	0.43	0.97	4.22	12.60	22.46	3.25	4.55	3.13	0.65	6.49
5.44	2.31	2.09	0.03	0.04	0.30	0.39	2.63	5.20	12.39	1.30	3.79	0.65	0.85	4.22
2.06	.00	0.15	.00	T.	.00	.00	1.14	2.64	4.11	1.56	2.73	0.57	0.24	0.53
1.88	0.08	0.25	0.43	0.43	0.55	1.15	.00	0.80	2.60	1.06	1.20	0.21	0.28	1.07
2.42	T.	.00	.00	.00	0.25	.00	0.81	3.52	6.17	1.38	4.63	.—	0.25	0.24
1.37	0.02	0.15	1.10	.00	.—	.—	.—	.—	.—	.—	.—	.—	.—	.—
2.03	.00	.00	.00	.00	0.58	.00	0.87	3.44	4.59	0.91	4.27	0.47	0.58	T.
.—	T.	0.10	.00	.00	0.50	.00	0.10	0.90	0.85	0.15	.00	0.19	0.32	0.62
.00	.—	0.31	1.86	2.66	1.38	0.38	0.50	1.19	.00	.—	1.42	0.02	0.25	.—
1.10	0.44	.00	.00	.00	.00	0.21	0.60	2.61	5.60	0.30	4.50	0.20	0.28	.00
1.46	.00	.00	.00	.00	0.68	.00	1.79	3.30	3.72	3.10	4.85	0.36	1.00	0.30
1.52	.00	.00	.00	.00	0.29	.00	0.55	2.63	3.23	.—	2.25	0.20	0.50	0.27
3.65	1.25	0.95	.00	.00	0.15	.00	1.60	4.10	9.35	2.70	2.79	.00	0.73	3.52
1.87	0.88	0.28	.00	.00	.00	.00	1.52	2.82	4.47	2.15	3.21	0.48	0.30	2.67
0.18	0.40	0.10	.00	.00	.00	.00	.00	1.60	1.35	.00	0.80	.00	0.38	.00
3.53	.00	.00	.00	.00	0.05	.00	1.05	3.38	4.39	0.76	2.05	.00	0.53	.—
1.39	0.05	.00	.00	.00	0.68	.00	0.94	2.40	3.74	0.82	2.86	0.38	0.39	.00
0.76	0.05	0.26	.00	.00	0.14	0.37	0.32	2.07	3.44	0.28	2.91	0.11	0.27	.00
1.90	0.02	.00	.00	.00	0.42	0.42	1.21	4.58	8.00	1.93	4.61	0.57	1.08	0.09
2.52	T.	.00	.00	.00	.—	0.22	0.90	1.41	.—	.—	3.40	0.44	.00	.00
2.94	0.14	.00	0.07	.00	.00	1.23	1.51	.—	.—	.—	.—	.—	.—	.—
1.28	.00	.00	0.02	.00	0.61	0.03	0.70	2.53	3.06	1.09	3.00	0.31	0.60	0.22

SEASONAL RAIN

STATIONS.	July, 1886	Aug., 1886	Sept., 1886	Oct., 1886	Nov., 1886	Dec., 1886	Jan., 1887	Feb., 1887	March, 1887
San Mateo, San Mateo Co.	0.07	.00	.00	1.69	0.77	0.95	1.21	9.16	0.72
San Miguel, San Luis Obispo Co.	.00	.00	.00	.00	0.24	0.21	0.52	5.96	0.12
Santa Monica, Los Angeles Co.	.00	.00	.00	.00	0.10	0.27	0.20	7.07	0.26
San Simon, Cochise Co., Arizona	.—	0.71	0.09	0.05	0.32	0.30	0.01	0.78	.00
Selma, Fresno Co.	.00	.00	.00	0.27	0.59	0.60	0.31	2.84	.00
Soledad, Monterey Co.	0.02	.00	.00	0.32	1.04	0.15	0.34	3.94	0.41
Southside, Los Angeles Co.	0.17	.00	.00	.00	1.00	0.23	0.14	7.37	.00
Spadra, Los Angeles Co.	T.	.00	.00	.00	1.05	0.40	0.20	7.36	.00
Stockton, San Joaquin Co.	.00	.00	.00	0.28	0.75	0.69	0.36	3.30	0.23
Sumner, Kern Co.	.00	.00	.00	.00	0.60	0.45	0.20	2.23	.00
Summit, Placer Co.	.00	.00	.00	3.10	1.70	5.75	6.25	20.70	1.40
Suisun, Solano Co.	.00	.00	.00	0.49	0.22	1.80	0.82	6.37	0.85
Tacoma, Elko Co., Nev.	0.50	0.40	0.10	0.18	0.22	0.32	1.00	0.88	0.40
Tehachapi, Kern Co.	0.10	.00	.00	T.	1.15	0.60	0.50	8.88	0.24
Tehama, Tehama Co.	.00	T.	.00	0.78	T.	2.00	0.33	4.29	1.10
Templeton, San Luis Obispo Co.	.—	.—	.—	.—	.—	0.78	0.61	7.21	0.47
Toano, Elko Co., Nev.	0.11	0.55	0.35	0.78	1.35	0.38	1.18	1.55	0.10
Towles, Placer Co.	.00	.00	.00	0.80	0.80	3.00	4.35	11.60	1.10
Tracy, San Joaquin Co.	.00	.00	.00	0.40	0.10	0.50	0.03	2.93	0.29
Truckee, Nevada Co.	0.89	.00	T	0.85	1.10	2.29	3.43	12.25	0.36
Terrace, Box Elder Co., Utah	0.15	.00	0.55	0.05	0.25	0.15	0.32	0.22	0.20
Traver, Tulare Co.	.00	.00	.00	0.10	0.67	0.95	0.45	3.05	0.32
Tucson, Pima Co., A. T.	.00	4.94	0.44	0.42	0.45	.00	.00	0.84	.00
Vallejo, Solano Co.	.00	.00	.00	0.47	0.83	1.77	1.15	7.72	0.46
Winnemucca, Humboldt Co., Nev.	0.61	.00	.00	1.72	0.73	0.89	0.62	1.71	0.40
Woodland, Yolo Co.	.00	.00	.00	.00	.00	1.29	0.80	5.38	0.65
Yuma, Yuma Co., A. T.	.00	.00	.00	.00	.00	.00	.00	.00	.00
Tuohys, Tulare Co.	T.	.00	.00	0.22	0.85	1.08	0.63	6.61	0.33
Sacramento, Sacramento Co.	.00	.00	.00	0.56	0.11	1.82	0.75	4.94	0.89
Williams, Colusa Co.	.00	.00	.00	0.60	.00	0.95	0.35	4.35	1.30
Willows, Colusa Co.	.00	.00	.00	.00	T.	1.19	0.17	2.77	1.16
Willcox, Grant Co., A. T.	0.32	2.39	1.40	0.22	0.21	0.01	.—	1.44	.00
Wells, Elko Co., Nev.	0.40	0.20	.00	0.50	0.50	3.25	0.80	1.35	.00
Wadsworth, Washoe Co., Nev.	.00	.00	.00	2.35	0.18	T.	0.28	2.52	.00
Turlock, Stanislaus Co.	.00	.00	.00	0.29	0.50	0.55	0.16	2.30	0.36
Tulare, Tulare Co.	.00	.00	.00	.00	0.55	0.55	0.45	1.98	0.11
Los Angeles, Los Angeles Co.	.00	.00	.00	.00	1.18	0.26	0.20	8.92	0.22
San Diego, San Diego Co.	T.	T.	.00	0.05	0.95	0.06	0.04	4.51	0.02
Los Angeles, Los Angeles Co.	0.27	0.21	0.11	0.02	1.18	0.26	0.20	9.25	0.29
Fresno, Tulare Co.	.00	.00	.00	0.57	0.80	0.44	0.40	2.79	0.17
Keeler, Inyo Co.	0.14	0.08	.00	0.01	0.08	.00	T.	0.93	.00
Yuma, A. T.	T.	2.23	.00	1.11	0.23	.00	.00	T.	.00
Red Bluff, Tehama Co.	T.	T.	.00	1.76	0.34	3.92	0.59	5.21	1.13
Fort Bidwell	0.41	0.04	.00	1.36	1.06	4.25	3.31	4.85	0.97
Eureka, Humboldt Co.	.—	—	1.00	2.00	6.00	9.00	8.86	9.07	2.28
Roseburg, Or.	2.20	T.	0.33	3.43	2.63	7.30	8.64	6.24	2.38
Portland, Or.	0.32	0.03	1.19	2.87	1.00	11.52	12.31	2.81	8.00
Olympia, W. T.	1.15	0.42	3.17	4.15	1.73	13.38	9.83	4.28	10.60
Tatoosh Island	6.52	4.70	5.54	7.81	10.44	25.84	14.46	11.30	16.36
Sacramento, Sacramento Co.	.00	.00	.00	0.68	0.21	1.12	6.28	0.94	2.53
San Francisco, San Francisco Co.	0.23	.00	0.01	1.48	0.84	2.07	1.90	9.24	0.84

"T"—Trace of precipitation. Amount too small to be measured.

FALL—Continued.

April, 1887	May, 1887	June, 1887	July, 1887	August, 1887	Sept., 1887	Oct., 1887	Nov., 1887	Dec., 1887	Jan., 1888	Feb., 1888	March, 1888	April, 1888	May, 1888	June, 1888
1.68	.00	.00	.00	.00	0.47	.00	1.08	3.44	4.73	1.21	3.97	0.13	0.67	0.08
1.40	0.24	0.26	.00	.00	0.58	0.37	0.49	2.84	4.06	0.13	2.34	.00	0.22	.00
2.47	1.40	.00	.00	.00	0.30	.00	1.13	2.93	6.98	.00	6.95	.00	.00	.00
0.10	.00	.00	.00	.00	0.10	.00	.00	.00	.00	.00	.—	.—	.—	.00
2.60	0.58	.00	.00	.00	.—	0.20	0.16	0.97	2.40	T.	2.57	0.10	0.31	.00
0.54	.00	.00	.00	.00	0.16	.00	0.51	1.47	2.86	0.55	2.10	0.15	0.35	.00
2.55	.—	.00	.00	.00	0.60	1.40	0.50	1.82	2.57	0.82	3.19	.00	6.15	.00
2.17	.00	.00	.00	.00	T.	.00	0.68	2.25	6.23	0.98	3.45	.00	.—	.—
1.37	.00	.00	.00	.00	0.28	.00	0.43	2.69	3.00	0.58	1.74	0.55	0.54	.00
2.04	.00	T.	.00	.00	0.55	0.10	.—	0.69	1.64	1.60	0.31	0.12	0.42	.00
5.80	0.95	1.60	0.10	T.	T	0.07	1.50	11.60	9.20	.—	8.05	2.30	1.44	3.72
1.74	.00	.00	.00	.00	.00	.00	0.96	2.79	4.30	1.58	3.97	.00	0.65	0.30
0.40	.00	0.10	0.65	0.15	0.40	.00	0.02	0.50	1.18	0.40	0.40	0.20	0.15	0.25
1.95	0.26	.00	.00	.00	.00	0.86	0.26	1.44	2.57	2.60	2.57	1.25	0.25	.—
1.56	0.45	.00	.00	.00	.00	.00	1.56	2.62	4.70	2.40	4.10	0.25	0.25	0.30
1.51	0.06	0.35	.00	.00	0.56	0.24	0.79	3.18	6.05	0.32	5.00	0.38	0.34	0.04
1.12	0.15	0.30	0 86	.00	.00	0.04	0.45	0.82	1.95	0.40	0.95	0.75	0.84	0.19
1.20	T.	.00	T	.00	.00	.00	0.90	.—	.—	.—	2.80	.—	.—	.—
3.02	.00	.00	.00	.00	T.	.00	0.05	2.43	1.99	0.84	0.61	.00	0.54	0.19
2.00	2.04	0.37	0.41	T.	.00	.00	0.30	4.80	2.35	.00	3.15	0.30	0.70	0.80
0.15	0.09	.00	.00	.00	.00	.00	0.30	0.10	.—	.—	.—	0.01	.00	0.05
2.27	0.70	0.14	.00	.00	0.26	.—	.—	0.97	.—	.—	.—	T.	0.11	.00
0.04	0.27	0.07	4.22	.00	1.99	0.43	0.23	0.07	0.12	0.15	0.68	.—	0.23	0.50
1.90	.00	.00	.00	.00	0.39	.00	0.48	3.06	4.52	.—	0.62	.00	0.45	0.16
1.62	0.44	1.06	0.09	0.13	0.32	.00	.00	1.55	1.37	0.63	0.15	0.20	0.50	0.26
1.53	.00	.00	.00	.00	.00	.00	0.40	3.30	4.25	1.27	2.38	0.10	1.10	.00
.00	.00	0.11	.00	.00	.—	T.	1.92	0.15	0.30	.00	.00	.00	.00	.00
3.15	2.50	.00	T.	.00	T.	.—	.—	.—	.—	.—	.—	.—	.—	.—
1.60	T.	.00	.00	.00	0.01	.00	0.33	2.11	4.42	0.57	2.46	0.13	1.27	0.03
1.26	.00	1.18	.00	.00	.00	.00	0.68	1.31	2.22	0.70	1.72	.00	0.67	0.08
2.78	.00	.00	.00	.00	.00	.00	0.95	2.17	2.99	1.38	1.82	0.08	0.24	0.29
0.08	0.40	0.54	3.51	5.15	2.68	0.45	0.31	0.78	0.75	.—	1.03	T.	0.07	.00
.00	0.05	.00	.00	.00	0.20	.00	0.30	0.70	1.75	0.10	1.35	.00	.—	.—
0.18	0.69	0.52	1.28	0.10	0.15	.00	.00	0.98	0.90	.00	.00	0.10	0.52	.00
1.08	.00	T.	.00	.00	1.00	.00	0.03	1.28	2.19	0.19	1.11	0.18	0.52	.00
1.52	0.90	.00	.00	.00	0.01	0.18	0.05	0.70	2.89	0.19	1.14	.00	1.11	.00
2.02	0.08	0.04	0.03	.00	0.15	0.14	0.85	4.35	7.59	1.17	4.63	.00	.00	.00
2.14	0.47	0.04	0.01	T	T.	T.	2.08	1.14	2.00	1.50	2.79	0.10	0.22	0.04
2.36	0.20	0.07	0.07	T	0.18	0.17	0.80	2.68	6.04	0.80	3.17	0.12	0.05	0.01
2.93	0.03	0.07	.00	.00	0.49	0.15	0.32	1.16	1.75	0.19	1.90	2.01	0.56	T.
1.14	0.04	T.	0.52	.00	1.08	0.84	0.01	0.48	0.70	1.21	0.30	0.83	0.30	0.20
0.20	T.	0.01	T.	T	1.09	0.02	2.43	0.15	0.18	0.05	0.05	T.	.00	.00
1.76	0.77	0.26	T.	T	0.06	.00	1.52	2.32	4.08	5.33	3.47	0.53	0.51	2.61
1.96	1.47	0.73	0.18	0.21	0.05	.00	0.38	2.40	3.28	1.81	3.28	0.16	1.50	2.38
5.55	3.51	1.92	0.06	0.07	0.21	.—	.—	.—	12.92	1.98	4.09	1.05	0.76	4.66
3.79	1.53	0.89	0.07	0.08	0.51	1.13	3.19	8.89	6.62	2.81	2.39	0.63	1.15	5.94
5.10	4.77	1.44	0.03	0.58	3.06	1.34	3.43	11.34	8.50	2.42	2.87	2.06	0.86	5.38
3.94	5.66	1.01	0.74	0.18	3.34	1.51	4.94	15.75	11.38	2.70	5.96	1.72	0.21	4.80
8.51	8.85	1.12	1.24	1.39	3.43	11.83	10.15	17.47	12.10	11.08	8.65	5.92	2.00	7.44
.00	.00	.00	T.	0.02	.00	0.45	2.09	4.81	4.81	0.57	3.04	0.10	0.40	0.08
2.30	0.06	0.07	T.	0.01	0.29	T.	0.99	3.34	6.61	0.94	3.60	0.11	0.38	0.27

ANNUAL METEOROLOGICAL REVIEW,

Showing the Climatic Condition in all its features for Seventeen Years, from 1871 to 1887, both years inclusive, at San Francisco, California; compiled by Sergeant Nelson Gorom, Observer in charge of the local Signal Station.

Annual Weather Review for Year:	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.
Average barometer	30.022	30.039	30.029	30.020	30.026	30.007	29.994	29.976	30.033	30.047	30.044	30.060	30.054	30.001	30.028	30.041	30.038
Highest barometer	30.42	30.48	30.49	30.41	30.41	30.42	30.42	30.43	30.59	30.49	30.41	30.49	30.67	30.54	30.45	30.40	30.56
Lowest barometer	29.53	29.43	29.54	29.55	29.65	29.36	29.66	29.43	29.29	29.48	29.67	29.74	29.63	29.43	29.42	29.32	29.53
Range of barometer	0.89	1.05	0.95	0.86	0.76	1.06	0.76	1.00	1.30	1.01	0.74	0.75	0.94	1.11	1.03	1.08	1.03
Average temperature	56.3	56.2	55.9	55.7	55.7	56.3	57.3	56.6	56.1	54.2	55.8	54.4	54.7	55.7	56.9	56.1	55.2
Highest temperature	84 0	92.0	79.0	89.0	82.0	93.0	92.0	78.0	89.0	83.5	83.0	83.0	95.2	83.0	87.0	93.9	96.9
Lowest temperature	42.0	41.0	40.0	39.0	39.0	36.0	42.0	39.0	34.0	37.0	40.0	34.5	35.0	35.0	43.0	41.0	33.1
Range of temperature		51.0	39.0	50.0	43.0	57.0	50.0	39.0	55.0	46.5	43.0	48.5	60.2	48.0	44.0	52.9	63.8
Greatest range of temperature	33 0	40.0	32.0	39.0	41.0	44.0	41.0	30.0	36.0	38.5	36.0	33.0	44.2	36.0	35.0	43.8	51.3
Least range of temperature	16.0	16.0	15.0	19.0	19.0	20.0	18.0	20.0	20.0	19.0	18.0	19.0	20.0	15.5	17.5	22.7	20.9
Average maximum temperature	73.3	72.6	70.4	72.0	71.5	74.2	74.8	71.0	75.5	71.8	72.0	70.0	75.4	71.5	73.7	77.9	78.8
Average minimum temperature	47.6	47.6	47.6	46.1	46.2	46.2	48.0	47.2	46.0	44.6	46.6	44.7	45.3	47.2	49.2	45.5	44.7
Average range of temperature	25.7	25.0	22.8	25.9	25.2	28.0	26.8	23.8	29.5	27.2	25.4	25.2	30.1	24.3	24.5	32.4	34.1
Average humidity	75.4	76.1	72.5	72.3	75.6	72.0	72.2	72.9	73.9	75.6	75.8	75.0	78.1	79.5	81.0	75.1	75.4
Average dew point													47.5	49.1	50.7	47.5	46.8
Prevailing direction of wind	S.W.	S.W.	S.W.	S.W.	S.W.	W.	W.	S.W.	W.	W.	W.	W.	W.	W.	W.	W.	W.
Total precipitation		22 42	18.56	22.52	22.63	23.54	11.93	33.26	30.76	30.07	23.73	18.67	15.43	38.82	24.90	20.02	19.04
Total movement of wind		81.468	84.201	83.709	85.995	81.618	80.949	79.387	78.575	82.724	83.105	85.554	81.480	78.557	79.194	78.237	80.457
Maximum velocity of wind	47	36	48	32	48	44	38	40	40	44	36	36	36	45	36	42	36
Direction at time of maximum velocity	N.W.	W.	S.W.	S.	N.	S.E.	N.	N.	N.E.	N.	W.	N.W.	W.	N.	W.	S.E.	W.
Total number of clear days		122	135	134	141	179	174	146	159	153	150	156	132	124	116	165	152
Total number of fair days		138	133	149	160	125	132	142	146	110	126	144	152	148	157	134	140
Total number of cloudy days		106	97	82	64	62	59	77	60	103	89	65	77	93	92	65	73
Total number of days of precipitation		69	64	71	58	59	46	75	85	70	65	73	51	83	70	64	60

Annual number of earthquakes (days)	2	1	1	0	3	2	1	4	0	4	6	6	6	2	6	10	3
Snow storms						1						1	0	1	0	0	1
Thunder and lightning	1	2	0	4	0	1	1	1	0	0	2	4	2	3	2	1	1
Annual number of solar halos						1	11	2	2	46	66	72	76	88	67	49	46
Annual number of lunar halos						5	0	8	9	6	16	30	17	20	21	25	34
Annual number of light frosts							2	21	22	49	23	19	33	15	21	15	36
Annual number of killing frosts											6	22	15	11	0	8	4
Total number of days maximum temperature was above 90°	0	1	0	0	0	1	2	0	0	0	0	0	3	0	0	2	1
Total number of days minimum temperature was below 32°	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

DAILY NORMAL TEMPERATURE AT SAN FRANCISCO.

The following table of normal temperatures for each day of each month, at San Francisco, as deduced from three daily observations for fifteen years, was furnished by Sergeant Nelson Gorom, the Observer in charge of the San Francisco local Signal Office:

DATE.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	50.3	52.2	54.4	55.1	56.4	57.9	58.5	59.1	59.8	59.4	57.3	54.7
2	50.7	52.7	54.6	54.7	56.8	57.7	58.4	59.2	60.6	59.2	56.0	53.1
3	50.0	52.4	54.0	54.4	55.6	58.0	58.3	58.3	60.0	60.2	55.9	52.7
4	50.3	52.3	52.7	54.6	55.6	58.9	58.9	58.6	59.9	58.9	57.1	53.6
5	52.3	51.0	54.0	53.5	55.5	60.2	58.4	58.8	59.0	59.0	57.0	54.0
6	51.0	50.6	53.4	53.1	56.0	60.0	58.0	58.9	58.3	59.9	57.7	53.2
7	51.7	50.6	52.9	53.9	57.1	58.7	58.4	58.3	58.6	61.1	58.3	52.6
8	51.3	51.4	52.7	54.9	56.2	58.9	59.0	58.4	58.7	60.5	57.8	51.4
9	50.5	51.5	52.9	54.6	55.3	58.9	58.9	58.6	58.9	59.2	57.7	50.8
10	50.3	51.1	53.1	53.9	55.4	59.1	58.8	58.7	59.8	59.9	56.1	50.9
11	49.3	50.7	53.7	54.0	55.4	60.0	58.9	57.9	60.3	60.0	56.1	50.5
12	48.5	51.0	53.6	53.8	54.7	60.0	59.4	57.8	60.4	58.9	55 4	50.3
13	49.2	51.6	52.5	53.1	54.7	58.7	58.9	58.1	60.7	57.3	55.4	51.0
14	50.7	51.1	52.7	54.3	54.8	57.4	58.7	58.5	61.0	57.9	56.3	51.7
15	50.2	51.8	52.9	54.7	55.1	57.7	58.8	58.2	60.0	58.9	55.9	51.6
16	51.0	52.0	52.6	53.8	55.7	57.8	58.7	57.6	59.9	59.5	56.0	51.0
17	50.4	51.7	52.8	53.9	55.6	57.9	58.2	58.2	59.6	61.4	55.5	50.2
18	50.3	50.9	54.5	53.6	56.5	58.6	57.6	58.5	58.9	61.3	54.8	51.2
19	51.2	51.6	54 2	54.0	56.7	59.2	57.6	57.8	59.7	59.9	54.1	52.3
20	49.9	53.0	54.1	53.9	56.1	59.6	57.8	57.3	60.8	58.9	55.1	52.3
21	50.0	53.6	53.9	55.2	56.4	57.7	57.6	57.9	61.7	59.4	55.7	51.9
22	51.3	53.8	54.6	55.8	56.3	58.2	57.7	58.1	60.3	59.2	56.1	51.9
23	51.1	53.8	54.0	56.5	57.3	58.1	57.7	58.2	59.8	58.8	55.7	52.4
24	50.8	52.4	54.6	56.1	58.0	56.9	57.9	59.2	59.6	58.2	55.0	53.3
25	50.9	52.7	54.5	54.4	58.7	57.2	57.9	58.8	61.2	58.5	53.5	52.7
26	50.3	53.3	55.5	54.4	58.0	58.6	58.8	59.2	58.8	59.7	53.4	51.5
27	50.5	52.9	55.6	54.9	57.9	57.0	58.7	59.6	59.0	58.8	54.2	51.5
28	50.6	52.6	54.5	55.8	57.1	57.6	58.6	59.1	60.0	58.0	54.4	51.5
29	51.5	51.5	54.7	55.2	57.4	58.2	58.8	59.6	59.9	57.7	55.6	50.1
30	51.4	------	53.9	55.7	58.5	58.1	58.6	60.5	58.9	57.2	55.0	49.9
31	51.5	------	54.6	------	58.7	------	59.5	59.3	------	57.6	------	49.7
Monthly	50.6	52.0	53.8	54.5	56.4	58.4	58.5	58.6	59.8	59.2	55.8	51.8

Red Bluff Weather from 1877 to 1887.

From the Signal Office records, and taken from the annual meteorological review of the State of California, by Sergeant James A. Barwick, Observer:

Annual Weather Review For:	1877.*	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.
Average barometer	------	29.58	29.64	29.65	29.65	29.64	29.67	29.62	29.65	29.65	29.64
Highest barometer	30.03	30.14	30.30	30.14	30.12	30.14	30.34	30.22	30.09	30.10	30.14
Lowest barometer	29.23	29.00	28.97	29.03	29.19	29.30	29.21	28.98	29.07	28.99	29.08
Range of barometer	------	1.14	1.32	1.11	.93	.85	1.13	1.24	1.02	1.11	1.06
Average temperature	------	64.0	63.3	61.2	62.1	60.2	61.5	60.8	64.4	63.2	64.4
Highest temperature	108.0	110.5	110.0	108.0	103.0	105.0	107.0	107.0	108.0	109.0	111.5
Lowest temperature	32.0	25.0	25.0	26.0	31.0	25.0	19.0	22.0	33.0	30.0	27.3
Range of temperature	------	85.5	85.0	82.0	72.0	80.0	88.0	85.0	75.0	79.0	84.2
Greatest monthly range of temperature	54.0	55.0	54.0	53.5	53.0	57.0	58.0	57.0	56.0	54.4	70.4
Least monthly range of temperature	34.0	25.0	36.0	27.5	32.5	30.0	39.0	35.5	32.5	34.5	35.9
Average maximum temperature	------	86.9	89.2	86.7	86.0	83.7	87.2	72.0	75.3	76.2	75.6
Average minimum temperature	------	41.4	41.3	39.8	41.1	39.5	39.8	49.7	52.8	52.4	51.4
Average range of temperature	------	45.5	47.8	47.0	45.1	43.9	47.3	44.0	44.8	46.6	50.0
Average humidity	------	53.2	52.5	51.4	55.1	58.0	55.1	59.3	57.5	55.3	47.0
Average dew point	------	------	------	------	------	------	41.5	43.5	45.2	42.8	39.5
Prevailing direction of wind	N.	N.	N.	N.	N.	N.	N.	N. S.	S.	N.	N.
Total precipitation	8.54	49.01	33.64	26.53	24.93	21.82	13.76	28.06	29.63	17.21	13.60
Total velocity of wind	28.805	70.220	*a*	*b*20.379	49.088	45.879	54.948	58.145	51.924	54.690	63.705
Maximum velocity of wind	30	46	52	60	42	40	36	48	44	50	45
Direction at time of maximum velocity	N.	S.E.	S.	S.E.	S.	S.	S.	S.	S.	S.E.	N. S.
Total number of clear days	128	232	207	230	204	215	261	225	223	212	213
Total number of fair days	32	72	90	74	103	89	67	84	96	91	98
Total number of cloudy days	24	61	68	55	58	43	37	53	46	59	54
Total number of foggy days	*a*	*a*	*a*	*a*	0	0	5	0	2	2	0
Total number of days of precipitation	27	79	83	66	72	69	44	71	70	63	57
Number of earthquakes	0	2	0	0	2	0	0	1	0	0	2
Snow storms	*a*	*a*	*a*	*a*	*a*	0	0	1	0	1	2
Thunder and lightning	*a*	*a*	*a*	*a*	*a*	7	7	7	7	3	5
Number of solar halos	*a*	*a*	*a*	*a*	4	9	0	0	0	0	2
Number of lunar halos	*a*	*a*	*a*	*a*	3	2	3	5	2	14	14
Number of light frosts	*a*	*a*	*a*	*a*	17	19	9	21	16	14	10
Number of killing frosts	*a*	*a*	*a*	*a*	4	10	37	15	3	6	18
Number of days maximum temperature above 90°	69	93	84	71	59	60	94	53	77	89	99
Number of days minimum temperature below 32°	0	12	16	26	1	17	33	15	0	7	12
Highest water in the river during each year	------	------	------	------	*c*28.6	*c*12.0	*c*13.0	*c*21.0	*d*21.1	*d*20.5	*d*18.3
Lowest water in the river during each year	------	------	------	------	*c*1.1	*c*0.10	*c*0.6	*c*0.10	*d*0.3	*d*0.3	*d*0.4
Range of water in the river	------	------	------	------	*c*27.5	*c*11.2	*c*12.6	*c*20.2	*d*20.8	*d*20.2	*d*17.9

*Station opened July 1, 1877—Six months, 1877. *a* No record. *b* Five months. *c* Feet and inches. *d* Feet and tenths.

RAINFALL AT RED BLUFF.

This table is made up from the Signal Service records, and shows the total rainfall for each calendar year from 1878 to date, and the rainfall by seasons from 1877–78 to date; also the totals for each month, with the averages from the opening of the Signal Office on July 1, 1877, to date:

YEAR.	January	February	March	April	May	June	July	August	September	October	November	December	Total for Year	Season of	Total for Season
1877	------	------	------	------	------	------	.05	.03	none	1.35	3.13	3.98	--------	--------	------
1878	20.71	16.66	4.16	2.21	.89	none	none	none	.42	1.56	1.66	.69	48.96	1877–78	53.17
1879	3.18	3.67	5.39	2.12	2.18	.30	.04	.28	sprin.	.48	6.05	9.95	33.64	1878–79	21.17
1880	2.01	1.66	1.70	7.05	1.04	none	none	none	none	.08	.14	12.85	26.53	1879–80	30.26
1881	9.40	2.79	.51	1.83	.79	.51	sprin.	none	1.07	1.61	.73	5.69	24.93	1880–81	28.90
1882	2.81	3.94	2.67	2.12	.33	.15	none	none	.49	2.80	5.07	1.44	21.82	1881–82	21.12
1883	.87	.39	2.60	1.96	2.96	none	none	none	1.04	2.68	.74	.52	13.76	1882–83	18.58
1884	3.55	2.21	7.81	4.31	.18	.97	none	none	.36	.90	.04	7.73	28.06	1883–84	24.01
1885	1.84	1.19	sprin.	.62	.64	1.37	.05	none	2.91	.10	17.05	3.90	29.67	1884–85	14.69
1886	4.80	.18	1.31	4.12	.73	sprin.	sprin.	sprin.	none	1.76	.34	3.94	17.18	1885–86	65.15
1887	.57	5.21	1.13	1.76	.77	.26	sprin.	sprin.	.06	none	1.52	2.32	13.60	1886–87	15.74
Totals	49.74	37.90	27.28	28.10	10.51	3.56	.14	.31	6.35	13.32	36.47	53.01	238.15	--------	252.79
Av'g's	4.974	3.790	2.728	2.810	1.051	.356	.013	.028	.577	1.211	3.315	4.819	33.815	--------	25.279

The following table gives the average highest and lowest temperature, and the total rainfall for each year from 1878 to 1888, also the highest and lowest temperature from the railroad records from 1875 to 1877, both years included:

YEARS.	Highest Temperature.	Lowest Temperature.	Clear Days.	Fair Days.	Cloudy Days.	Days .01 Inch or More of Precipitation.	Total Yearly Precipitation, Inches.
*1875	104	33	----------	----------	----------	----------	26.10
*1876	106	35	----------	----------	----------	----------	18.75
*1877	112	40	----------	----------	----------	----------	10.12
†1878	103	30	141	160	65	54	20.86
†1879	104	30	173	146	36	48	17.41
†1880	97	30	141	171	54	51	18.65
†1881	102	34	172	154	39	24	5.53
†1882	100	32	197	109	41	39	10.74
†1883	104	28	183	143	29	33	14.14
†1884	102	34	189	110	67	71	40.39
†1885	108	36	181	145	38	26	10.09
†1886	98	32	190	131	43	32	17.20
†1887	100	33	196	129	39	36	16.19

* Railroad record. † Signal Service record.

CLIMATE OF CALIFORNIA BRIEFLY DESCRIBED.

There are essentially two climates in California. The land climate and the sea climate. The latter derives its low temperature from the ocean, the water of which, along the coast, stands at from 52 to 54 degrees all the year round. The evenness of the ocean temperature is owing to a steady current from the north, which is accompanied also by winds in the same direction during the entire summer season, or rather from April to October, inclusive.

Almost daily, during this period, a deluge of cold, damp air, of the same temperature as the ocean over which it has passed, is poured upon the land. It is mostly laden with mists in dense clouds, which it deposits at the foothills and on the slopes of the highlands, or carries a short distance into the interior, wherever there is a break in the land wall.

The land climate is as nearly as possible the opposite in every respect. In summer and autumn it is hot and dry. It undergoes various modifications from the configuration of the surface of the earth. Even the mountains, which retain the snow to a late period, present a high temperature in the middle of the day, and the presence of snow on their summits in June is owing to the great mass which has accumulated on them, rather than to cold weather. A large district of territory lies between the jurisdiction of the two climates and subject to their joint influence. It is composed chiefly of valleys surrounding the bay of San Francisco and penetrating into the interior in every direction. There is no climate in the world more delightful than these valleys enjoy, and no territory more productive. Whilst the ocean prevents the contiguous land from being scorched in summer, it also prevents it being frozen in winter. Hence ice and snow are not common in the ocean climate.

The difference in temperature is comparatively slight between summer and winter. The absence of warm weather in the summer months is characteristic of the coast climate, and strikes a stranger forcibly. The most ordinary programme of this climate for the year is as follows, beginning with the rainy season: The first decided rains are in November or December, when the country, after having been parched with drought, puts on the garb of spring. In January the rains abate, and vegetation advances slowly, with occasional slight frosts. February is spring-like, with but little rain. March and April are pleasant and showery, with an occasional hot day. In May the sea breeze begins, but does not give much annoyance. In June, just as warm weather is about to set in, the sea breeze comes daily, and keeps down the temperature—it continues through July and August, occasionally holding up for a day or two, permitting the sun to heat the air to a sweating point. In September the sea wind moderates, and there is a slight taste of summer, which is prolonged into the next month. The pleasant weather often lingers in the lap of winter, and is interrupted only by the rains of November or December.

Though the nights in the interior are not so uniformly cool, yet there are few localities, even in the valleys, where they are too warm for sleeping, even though the day temperature may have reached 100 degrees. This is a remarkable feature of the climate of the Pacific States, and it has an important bearing on the health, vigor, and character of the population. In speaking of the "rainy season," strangers will not infer that the rain is perpetual, or nearly so, during that time. The term is employed only in contrast with the dry season, and it implies the possibility rather than the actual occurience of rain. In more than half the winters there is not a drop beyond the necessities of agriculture, and even in the seasons of most rain much pleasant weather is interspersed. If the winter be not extraordinary, it is generally regarded as the most pleasant season of the year. In the intervals of rain, it is bright, sunny, and calm. It is spring rather than winter. The grass starts as soon as the soil is wet. At Christmas, nature wears her green uniform almost throughout the entire State, and in February and March it is set with floral jewels. The blossoms increase in variety and profusion until April, when they are so abundant in many places as to show distinctly the yellow carpeting on hills five miles distant.

In the Atlantic States the storms of approaching winter put a stop to the labors of the farm, and force both man and beast into winter quarters. In California it is just the reverse. The husbandman watches the skies with impatient hope, and as soon as the rains of November and December have softened the soil, every plow is put in requisition. Nothing short of excess or deficiency of rain interferes with winter farming. The planting season continues late, extending from November to April, giving an average of nearly six months for plowing and sowing, during which the weather is not likely to interfere with outdoor work more than in the six spring and summer months of the Eastern States. Owing to the absence of rain, harvesting is conducted, which would confuse the ideas of an Atlantic farmer. There are no showers or thunder gusts to throw down the grain, or wet the hay, or impede the reaper. The hay dries in the swath without turning. The grain remains standing in the field awaiting the reaping machine, it may be, for a month after it is ready to cut—and so it remains when cut, awaiting the thrasher. When thrashed and sacked, the sacks are sometimes piled up in the field a long time before removal. In September or October the great grain-growing valleys may often be seen dotted over with cords of grain in sacks, as secure from danger from the weather as if securely housed. Owing to the absence of severe frosts, the gardens around San Francisco supply fresh vegetables all through the winter. New potatoes often make their appearance in March. In May the potatoes are full grown, and the largest weigh a pound or more. Many of the interior valleys are subject to malarious fevers, but not generally of a severe type. The various forms of disease which prevail elsewhere are found here, but they present no peculiarities worthy of comment. Insanity and diseases of the heart and blood vessels are frequent, but this is due rather to moral and physical causes than to climatic influence. The relation of the climate to pulmonary affections presents its most important aspect. Many persons threatened with lung disease, or but slightly affected by it, have regained their health completely by immigration to this State.

The Sacramento Valley.

It would be impossible in this brief space to give an exhaustive description of our great valley, or even to fully outline the characteristics which long since placed this part of California on a footing with the most favorable localities of the continent. Aside from its geographical peculiarities, which are fast giving us an enviable reputation at home and abroad, this section is rich in historical reminiscences.

These date from the earliest pioneer times—the days of the unfortunate Donner party, and of the generous Captain John A. Sutter—the days when placer mining was the chief industry, and the whims of the people the law, to the present, when we find in the "great valley" the industries of refined culture, and a development resting upon sobriety, energy, and intelligence. In fact, the history of Northern California is pregnant with all the variety of items which go to show the steady advancement necessary to a sure, sturdy, and independent growth of one of the most interesting sections of our great commonwealth. But these must be passed, at least for the present.

The valley proper is one of the largest of its class in the world, and extends from Shasta County on the north to San Joaquin on the south, and is limited on the east and west only by the lofty mountain ranges, whose snow-capped peaks point skyward; fit emblems of their supremacy. To the northward, and plainly visible for one hundred miles, Mount Shasta rises heavenward nearly fifteen thousand feet, and is second in altitude in the United States.

The Sacramento River, the largest stream in the State, traverses the valley from north to south, and is the natural line of commerce. Tributaries from the Sierra Nevada and Coast Range flow into the Sacramento on either side, and are, in some instances, themselves navigable. The Sacramento rises in the extreme north, and flows southward to Suisun Bay, from which, by San Pablo and San Francisco Bays, it has communication with the Pacific Ocean. A feature particularly noticeable from the geographer's standpoint, and not without interest to the intelligent homeseeker, is the fact that the streams of the valley, after reaching the plains, follow the higher sections, thereby furnishing unequaled facilities for irrigation. The artificial watering of crops has not heretofore been considered necessary, but is deemed of value in a few special instances.

The valley for a quarter of a century has been devoted to agriculture, and until recently almost exclusively to grain raising. From the first it was found that wheat growing was remunerative employment, and with that, content with good enough, which was so common a characteristic of the pioneer immigrant, no loftier ambition was stimulated. And, notwithstanding the discouraging depression of the grain markets in previous years, there never has been a time when the thrifty farmer could not meet his liabilities, and point to a little surplus he could call his own. Of late years, however, considerable attention has been devoted to fruit raising, and now large shipments are daily made, through the fruit season, to San Francisco and eastern markets. The fruit produced is of excellent quality, both as regards appearance and flavor, which fact is abundantly attested by the awards in its favor lately made, when brought into competition with similar products from other sections. As immigrants from the East and Europe arrive, a large proportion at once enter into horticultural pursuits, and are amply rewarded. Lately much attention has been devoted to the citrus fruits, and already our oranges and lemons rank favorably with the products of the older countries.

Although the Sacramento Valley has long been settled, and for the most part made subject to continual tillage, there is yet room for development; and as fruit interests gain in strength, and small farming is consequently encouraged, there will be room for thousands where now are hundreds, and the wealth of the country will be correspondingly increased. In this connection it may be interesting to know what lands are subject to cultivation. A good authority gives the following estimate: Plain land, 4,000,000 acres; foothills proper, 4,500,000 acres; upper foothills, 4,000,000 acres; mountains, between 1,000 and 2,000 feet elevation, 6,000,000 acres, making the total acreage of the land described 18,500,000 acres.

A few of the cities and larger towns may be mentioned briefly. On the direct route of commercial traffic is Sacramento, a large and flourishing city, the capital of the State, and the seat of numerous institutions of the arts, sciences, and learning; Marysville, the center of vast agricultural districts, which has direct commercial connection with the outside world by water and by rail, as well as the home of several noted factories and institutions of learning; Chico, now one of the most prosperous little cities in the State, and the location of the new Normal School; Oroville, with its colonies and orange groves, and others of which we cannot even speak.

The best evidences, however, of the possibility of the Sacramento Valley, are shown by the interest manifested by those who visit us, and have already cast their lot with ours.

Foreign Temperature, by Sir James Clark, with Palermo, Algiers, and Mentone added to the table by Dr. Henry Bennett, from whose work, "Winter and Spring on the Shores of the Mediterranean," the following table was taken:

NAME OF PLACE.	MEAN TEMPERATURE OF MONTHS.												MEAN TEMPERATURE OF SEASONS.				Mean Annual Temperatnre.
	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Winter.	Spring.	Summer.	Autumn.	
Cairo	58.1	56.1	64.6	77.9	78.3	83.7	85.8	85.8	79.2	72.3	63.0	61.3	58.5	73.6	85.1	71.5	72.2
Santa Cruz (Canaries)	63.8	64.3	67.2	67.3	72.1	73.9	77.3	78.9	77.4	74.7	70.4	65.8	64.6	68.9	76.7	74.2	70.9
Ceylon (Hill District)	69.2	66.5	70.8	72.7	71.4	69.4	69.8	68.9	70.8	70.9	70.6	69.7	69.3	70.8	69.5	71.3	70.2
Malta	56.5	56.3	58.1	61.8	67.4	73.8	79.6	81.2	77.8	71.1	64.2	59.6	57.5	62.8	78.2	71.0	67.3
Corfu	52.6	51.8	54.6	58.3	66.7	72.3	77.7	81.3	78.3	70.8	63.8	58.4	54.3	59.8	77.1	71.0	65.6
Madeira	59.7	60.3	61.9	62.0	63.4	66.9	70.0	71.9	71.3	66.8	64.0	61.4	60.6	62.4	69.6	67.3	65.0
Palermo													53.1	59.3	74.7	66.8	64.4
Algiers													55.0	66.0	77.0	60.0	64.0
Port Jackson (N. S. W.)	61.7	71.6	69.6	64.0	59.7	54.9	53.9	55.3	59.3	63.5	67.7	69.2	54.6	63.4	70.9	64.0	62.9
Cadiz	51.4	53.7	55.2	59.6	63.8	68.2	70.3	72.9	70.2	67.1	58.8	53.6	52.9	59.5	70.4	65.4	62.9
St. Michael's (Azores)	59.0	59.0	59.5	61.0	63.0	67.0	68.0	70.0	68.0	63.0	56.0	55.6	57.8	61.2	68.3	62.3	62.4
Naples	46.5	48.5	52.0	57.0	66.5	71.0	75.0	76.5	72.5	65.0	54.5	50.5	48.5	58.5	70.8	64.5	61.4
Mentone	48.2	48.5	52.0	57.2	63.0	70.0	75.0	75.0	69.0	64.0	54.0	49.0	49.5	60.0	73.0	55.6	60.8
*San Remo	47.2	50.2	52.0	57.0	62.9	69.2	74.3	73.8	70.6	61.8	53.3	49.3	48.9	57.3	72.4	61.9	60.2
Rome	47.6	49.4	52.0	56.4	64.5	69.2	73.3	74.0	69.5	63.6	58.8	49.6	48.9	57.6	72.2	64.0	60.7
Pisa	44.0	48.1	51.5	56.3	63.8	70.6	77.5	77.5	73.5	62.6	52.3	47.0	46.0	57.2	75.2	62.8	60.6
Genoa	41.6	47.5	51.1	60.3	64.4	73.5	75.1	76.5	73.2	64.7	51.0	45.6	44.6	58.6	75.0	62.9	60.4
Toulon	40.0	44.0	48.0	55.0	68.0	70.0	74.0	79.0	64.0	62.0	51.0	46.0	43.3	53.7	74.3	59.0	59.9
Marseilles	54.8	45.1	49.1							58.2	50.4	46.6	45.5	57.6	72.5	60.1	59.5
Nice	45.8	49.0	51.4	57.0	63.0	69.0	73.6	74.3	69.4	61.8	53.7	48.6	47.8	56.2	72.3	61.6	59.5
Florence	41.0	45.0	48.0	56.0	64.0	69.0	77.0	76.0	70.0	59.0	53.0	47.0	44.3	56.0	74.0	60.7	59.0
Port Philip (N. S. W.)	67.6	68.9	65.7	58.6	55.6	50.9	49.2	50.1	54.5	58.2	62.5	65.9	50.1	58.4	67.5	60.0	59.0
Auckland (N. Z.)	67.9	67.3	64.2	60.5	54.7	51.4	49.0	51.7	54.0	56.4	60.1	63.9	50.7	56.8	66.4	59.8	58.4
Avignon	42.0	43.5	50.5	55.0	66.0	72.0	76.0	76.0	67.0	60.0	50.0	43.3	42.6	57.1	74.7	59.0	58.2
Montpelier	42.0	45.0	47.0	53.0	60.0	67.0	72.0	75.0	71.0	61.0	52.0	46.0	44.2	53.3	71.3	61.3	57.6
Pau	41.2	43.6	48.8	51.8	61.6	68.2	70.6	73.4	67.4	58.2	46.6	42.8	41.8	54.1	70.7	57.4	56.2
Sienna	39.7	40.2	46.2	53.7	62.4	67.5	72.8	72.3	66.0	58.3	47.1	41.7	40.5	54.1	70.8	57.1	55.6
Baths of Lucca				53.0	60.5	63.0	70.0	71.5	66.0						68.2		55.0
Paris	35.6	40.5	43.5	49.6	58.1	62.5	65.7	65.2	60.4	52.4	44.2	39.2	38.4	50.4	64.5	52.3	51.5
*Cannes													49.6	51.4	73.0	61.0	59.9
*Valencia													50.7	63.0	75.3	66.0	63.8
*Gibraltar													58.0	66.0	77.0	67.0	64.0
*Lisbon													54.0	59.0	68.0	59.0	61.0
*Mexico													53.6	63.4	65.2	60.1	60.6
*Jerusalem	49.4	54.4	55.7	61.4	73.8	75.2	79.1	79.3	77.0	74.2	63.8	54.5	52.8	63.6	77.9	71.7	66.5

* Added to the table by Sergeant Barwick.

AVERAGE TEMPERATURE, HIGHEST AND LOWEST TEMPERATURE, AND AVERAGE RAINFALL AT PROMINENT POINTS IN CALIFORNIA.

The following table shows the average temperature for the winter, spring, summer, and autumn; also the highest and lowest temperature and the average precipitation at the most prominent and well known points in California. This table makes it possible to compare different places in California with the table of foreign temperature that precedes this one.

NAME OF PLACE.	Average Winter Temperature	Average Spring Temperature	Average Summer Temperature	Average Autumn Temperature	Average Annual Temperature	Highest Temperature	Lowest Temperature	Average Precipitation—Inches
Redding	47.8	61.1	81.0	65.3	63.8	110	18	36.66
Red Bluff	46.8	59.8	79.7	63.2	62.4	110	16	27.46
Chico	47.3	62.4	81.3	64.2	63.8	110	18	20.84
Oroville	52.0	64.5	78.8	64.3	64.9	102	20	22.11
Marysville	50.1	62.7	78.3	65.6	64.2	108	18	16.60
Auburn	46.2	56.4	74.3	61.7	59.7	106	13	33.15
Sacramento	48.3	59.5	71.6	61.6	60.2	108	19	19.80
Woodland	48.3	61.6	77.7	63.8	62.8	106	19	16.60
Stockton	48.1	59.7	72.3	61.7	60.5	110	18	13.54
San Francisco	51.3	54.6	58.5	58.2	55.7	95	33	24.25
Petaluma	48.2	55.9	64.2	57.7	56.5	103	18	22.32
Oakland	49.8	55.3	60.5	56.7	55.6	103	25	24.54
Napa	48.9	59.6	69.6	59.1	59.3	104	18	23.36
San José	49.2	56.6	66.2	58.9	58.0	108	24	12.95
Santa Cruz	51.8	57.7	62.2	59.6	57.8	98	30	25.88
Monterey	50.9	56.7	61.6	57.1	56.6	90	25	14.96
Fresno	50.2	64.9	84.1	67.6	66.7	115	18	9.57
Visalia	45.4	59.4	80.8	60.3	61.5	109	18	9.82
Sumner	49.6	65.0	85.1	65.5	66.3	113	18	5.02
Santa Barbara	54.3	59.4	67.7	63.1	61.1	102	28	16.92
Los Angeles	53.6	58.4	67.8	62.7	60.6	112	28	17.64
Anaheim	56.0	64.3	73.1	66.7	65.0	108	25	11.01
Newhall	48.3	58.9	74.0	62.3	60.9	114	18	14.63
Riverside	50.4	64.1	73.7	65.7	63.5	105	25	8.16
Colton	52.0	62.7	78.3	65.3	64.6	116	18	9.84
Poway	50.7	57.6	68.8	60.8	59.5	110	21	14.15
San Diego	54.6	58.1	66.8	62.6	60.5	101	32	11.01

CLIMATIC COMPARISONS OF SANTA BARBARA WITH THAT OF SAN REMO AND MENTONE.

By Sergeant JAMES A. BARWICK, Observer Signal Corps, Sacramento, California.

Mentone and San Remo's climate, compared with Santa Barbara during each month of the year, shows that that of Santa Barbara is far superior as a summer and winter resort. The summers of San Remo and Mentone are as hot as those of the Sacramento and San Joaquin Valleys, and therefore cannot compare favorably with Santa Barbara, which has the finest and best summer temperature of any place on the Pacific Coast. The following temperature tables of Santa Barbara were compiled from Mr. Hugh D. Vail's records for 1885, 1886, and 1887, and is the average of these years. Those at Mentone are from M. de Brae's record of ten years. They are a valuable addition to tables already published for comparison with the California climate. Santa Barbara will be seen to far excel either San Remo or Mentone as a winter resort. Comparing Santa Barbara in summer, with the Italian climate, is simply a waste of words and space; for the table of comparison tells more plainly and more eloquently the great superiority of the climate of Santa Barbara over the places mentioned. The table is as follows:

Santa Barbara, Mentone, and San Remo's Comparative Temperature Tables.

MONTHS.	Mean Average Monthly Temperature at Santa Barbara.	Mean Average Monthly Temperature at Mentone, France.	Mean Average Monthly Temperature at San Remo, Italy.
January	54.3	48.2	47.2
February	55.6	48.5	50.2
March	56.4	52.0	52.0
April	58.3	57.2	57.0
May	60.2	63.0	62.9
June	62.6	70.0	69.2
July	65.7	75.0	74.3
August	67.0	75.0	73.8
September	65.6	69.0	70.6
October	62.1	64.0	61.8
November	58.0	54.0	53.3
December	55.3	49.0	49.3
Average for twelve months	60.1	60.4	60.1

The lowest temperature ever recorded at Santa Barbara was 28.5 degrees, during the cold wave of January, 1888; while an acknowledged minimum temperature in ten years at Mentone has been recorded as 32 degrees. But Mr. Bennett in his book says: "In more severe winters I have repeatedly known the thermometer to descend below 32 degrees several nights consecutively, near the seashore, and at the outlet of the torrent beds, especially in the western bay. Slight films of ice then form on shallow pools on the road and near the torrents."

This has occurred at Santa Barbara upon but one night, and not as at Mentone several nights consecutively. The above table is one of the strongest advocates for Santa Barbara as being the very best winter climate in the northern hemisphere from year to year and month to month. Dr. Bennett says of Mentone, speaking of the ten years' mean obtained by him from 1859 to 1869 for six months each year, and those obtained by M. de Brea's ten years' record from 1850 to 1860, that such results show how very uniform the climate of Mentone is, especially when a sufficiently large number of years are thus compared. Now, if Dr. Bennett thinks the climate of Mentone so very uniform, what would he think of the comparison as above with Santa Barbara; the latter's mean yearly temperature as deduced from ten years of observation by different parties, with observations at different hours, is 60.2 degrees, while in the above table the mean for each month and the year are the average of the three years—that of 1885, 1886, and 1887, and are the same as that made by other parties. It ought to do a Californian good to look at each month of the above table, and see how much warmer the Santa Barbara climate is in the winter, spring, and fall, and how much cooler it is in the summer than the far famed and much advertised Mentone and San Remo. Santa Barbara had two hundred and fourteen clear days out of two hundred and eighty-nine that were observed during 1887 by Mr. Hugh D. Vail, from whose records the above facts are obtained. Mentone and San Remo has but an average of two hundred and fourteen clear days out of three hundred and sixty-five. This comparison speaks much, yes, very much indeed, for Santa Barbara—not only as a winter resort but a summer resort as well. Mentone and San Remo have about as hot a summer temperature as does Riverside and the Sacramento and San Joaquin Valleys, and being much more moist than the California points mentioned, would make an atmosphere of almost suffocation, like New York, Philadelphia, and other eastern cities.

IRRIGATION AND FORESTRY CONSIDERED IN CONNECTION WITH MALARIAL DISEASES.

By H. S. Orme, M.D., President of the State Board of Health.

The subject of irrigation in a sanitary point of view has for some time occupied the attention of physicians and other scientists. It is a subject upon which opinions differ, and in a country where the system is so extensively practiced as in California, it becomes of the first importance to ascertain its effects upon the general health of the population. The study is an interesting one to the sanitarian, on account of the different effects observed in the different localities.

Irrigation has been practiced in California since the establishment of the early Missions, more than a century ago; but little improvement has been made in the application of the system, the object of the cultivator being to get the water upon his land without regard to the methods employed. The establishment of irrigation companies, however, bids fair to remedy this evil, and careful investigation and scientific research will doubtless soon develop the best methods of irrigation and their proper application to different localities. I have thus far personally investigated this subject only in the locality in which I reside (Los Angeles and vicinity), and the result of my observations convinces me that no evil effects are to be dreaded from irrigation *when properly conducted.* The higher lands, when planted with trees and vines and well irrigated, show no traces of malarial influence. The soil, being a gravelly loam, readily absorbs the moisture, and the conformation of the land affords ready surface and subsoil drainage.

It is mostly on alluvial lands that evidences of malaria are manifest. In some sections along river banks the soil, fertile with humus (the dead matter of prior vegetation), is charged with the elements of malaria, which only await a summer temperature above 60 degrees and an upturning of the surface to induce that poisonous fermentation which destroys health and endangers life. Such regions, however, are limited, and wherever the character of the land renders it susceptible of drainage, the evidences of malaria disappear. In many instances, where diseases are attributed to malarial influences, I am convinced that the true source of the evil lies in the habits of the people and the disregard of sanitary laws. Improper food and clothing, reckless exposure, the use of surface water for drinking purposes, and, above all, personal uncleanliness, will engender diseases closely allied to those produced by malaria, and these conditions are too often to be found among the lower classes of our people. It is undoubtedly a fact that the distribution of large quantities of water over a great extent of land surface, and allowing it to stagnate, is an active agent in producing malarial diseases. For example, the willow swamps adjoining the south end of Tulare Lake in 1860, 1864, and 1868 were great hotbeds of malaria. During the heavy winter rains hundreds of acres were overflowed, and remained for months great, stagnant lakes, poisoning the air with their deadly exhalations, fatal as those of the upas tree. *Irrigation, in order to be innocuous, must go hand in hand with drainage.* This fact has been demonstrated time after time, by the drainage and cultivation of marshes whose noxious exhalations had previously rendered their vicinity uninhabitable, but which, after drainage and cultivation, became healthful and fertile lands. These results are due to the removal of the superabundant moisture and the conversion of the decomposing organic matter into plant food.

The rainfall of the past few years, especially in the southern portion of the State, has been greater than usual. We may, therefore, look for an increase of malarial diseases, especially upon the low, flat lands, during the ensuing summer and autumn. The upland sections will probably not be affected, owing to the porosity of the soil and consequent subdrainage. From the fact that localities having all the natural conditions that indicate malaria, such as uplands remote from the sea, shut out from the health-giving influence of the prevailing winds by ranges of intervening hills, and having a high summer temperature, with abundant irrigation, exhibit no symptoms of malaria, while lands nearer the ocean, upon the open plain, exposed to the full force of the daily sea breeze, and where one would naturally least expect to encounter malarial influence, often develop it in a virulent form, is conclusive proof, to my mind, that the exemption of the first named localities is due to ample drainage, and the malarious character of the second may be attributed to the want of it. When the question of irrigation becomes thoroughly understood, and is practiced upon scientific principles, there will, in my opinion, be little danger from this source. This will doubtless be accomplished, as I have before stated, under the influence of the irrigation companies or societies already formed, and who are giving the subject their earnest attention, both in an economic and sanitary point of view. In this relation the "West American Scientist," in an article on "Forest Influence on Climate," in a paper read before the Royal Meteorological Society of London, by Dr. Woeikof, states that the first scientific investigation of the influence of forests upon climate was made by the establishment of the Bavarian forest meteorological stations. Germany, France, Switzerland, Italy, and other countries followed this example. In general it has been found that during the warmer season the air and earth temperatures are lower in the forest than in the neighboring woodless localities; that their variation is less, and that the relative humidity is greater. A discussion of this question shows that forests materially influence the temperature of neighboring localities, and that they cause the summer to be cooler in regions situated further in the interior than those nearer the sea. Hence forests exert an influence upon climate which does not cease at their borders, but is felt over a greater or less district, according to the size, kind, and position of the forests. Thus climate may be affected by the planting or destruction of forests.

Therefore, in this connection the subject of forestry or arbor-culture may be properly considered as prophylactic to malarial or miasmatic diseases. It is a well established fact that in malarial districts the planting of shrubs and trees has had the effect to greatly modify, if not entirely remove, the malarious influence. The *Helianthus*, or sun flower, which possesses superior power as an absorbent, has been successfully used in various localities, notably in the marshes near the Federal Capitol, once reported so prolific of malignant fevers. The bayous and lagoons formed by the inundations of the Mississippi River in Louisiana would naturally be regarded as the headquarters of malaria, yet this district enjoys a comparative immunity from malignant fevers, owing, it is believed, to the influence of a large flowering aquatic plant, belonging to the natural order Onograceae (*Jussiæ grandiflora*), which grows there in luxuriant abundance. But far more efficacious than all, owing to the rapidity of its growth, its wonderful powers as an absorbent, and the balsamic exhalation of its essential oil, is the Australian blue gum tree (*Eucalyptus globulus*). The genus eucalyptus contains over seventy species, of which six or eight have been introduced into California. Inferentially it may be said, that similar properties prevail among the species, though they may differ in their proportion of properties.

In a valuable paper read before the Medical Society of the State of California, Dr. W. P. Gibbons says: "It has not been proved, though asserted until belief is established, that the aroma of the eucalyptus is effective in preventing the incubation of intermittents. The exceedingly rapid growth of the tree is dependent upon the quantity of water which is accessible to its roots. The proverbially unhealthy atmosphere of swamp lands is due to stagnant water. Where currents are established by drainage or by excess of water, the cause of malarial fever if not entirely removed, is materially abated—it would be removed if the drainage were complete. Let us look at the results which naturally follow the planting and cultivation of some kinds of forest trees. In eight years the eucalyptus will attain a diameter of eighteen inches and a height of fifty feet. Experiments which I have made determine these facts: A branch of this tree which contains one hundred and five square inches of leaf surface, will absorb 3.25 ounces of water in eighteen hours. The entire tree will furnish an area of three hundred and ten thousand five hundred square inches of leaf surface, and the amount of water daily absorbed by the roots would equal six hundred and nine pounds or seventy-six gallons. Given a stagnant swamp of two hundred acres, each acre having two hundred trees, the amount of water daily absorbed by the roots would be three million and forty thousand gallons, or four hundred and five thousand three hundred and thirty-three cubic feet. This would be equal to a constant stream running at the rate of three miles per hour, two feet wide, six inches deep."

These results, wonderful as they may seem, are undoubtedly correct, and illustrate with vivid force the importance of planting this tree in malarial districts, not by setting out here and there a tree, but by planting them in forests, as has been done by Mr. Nadeau in the vicinity of Los Angeles, where the largest artificial forest in the State was planted by him. Mr. Nadeau, in December, 1875, sowed the seed of the eucalyptus in his nursery, and in six months thereafter transplanted the young plants in the location intended for their permanent occupation (eight feet apart), and now these trees have attained a growth of from seventy-five to one hundred and twenty-five feet in height, with an average diameter of twelve to fifteen inches. The extent of this grove is about one hundred acres, and for fuel, counting fifty cords to the acre, at $5 per cord, would amount to $250 to the acre. Its value for fuel and timber (at this time the trees being ten years old) is not less than $20,000. Were this tree to be liberally planted in our marshes and swamps at intervals through the great valleys of the Sacramento and San Joaquin, there can be no doubt that the effects of malarial exhalations would be in a great measure neutralized. The Central Pacific Railroad Company has done much to bring this tree into notice by planting different varieties of it along the lines of their road, thus giving an opportunity to judge of the species best calculated to thrive in different soils and climates. Mr. J. Bosisto, President of the Pharmaceutical Society of Victoria, points out that the eucalyptus probably exerts its influence in this respect: "First, physically, by powerful root action in absorbing humidity from the earth; by its being evergreen, and in continued action; by the abundance of its leaf surface; by its evaporation of water, oil, and acid under a perpetually genial atmosphere; and, second, chemically, by the power of its volatile oil and volatile acid, abundantly present in the plant and air to produce peroxide of hydrogen." According to Dr. Cosson: "Since the growth of plantations of this tree around the Lake of Fezzara, in Algeria, the malaria, which formerly was intense, has almost disappeared. The village of Ain Mokra, according to Captain Ney, furnishes an equally striking instance. The station was formerly so unhealthy that it was necessary to change the French garrison every five days on account of the number of men attacked. Fever has, however, become much more rare since plantations of eucalyptus trees have been made on the shores of the lake and the sides of the railway, which include altogether sixty thousand trees. A writer in the 'Paris Temps' mentions astill more singular effect, namely, that the parasites (phylloxeræ, etc.) disappear from vines growing near the eucalyptus. The experiment made during several years in several vineyards, has been uniform in its results. It is interesting, in connection with these facts, to observe that the leaves of this plant contain an ethereal oil, of which even half-dried leaves contain 6 per cent, and that this oil, according to Gimbert, is a very powerful antiseptic. The oil is officinal in the last edition of the United States Dispensatory. It will preserve blood and pus as long as carbolic acid (five months and more), and far longer than oil of turpentine. It prevents also the appearance of fungi or vibrios. These observations have received independent confirmation from Binz, in Germany."

With such evidence before us, we can scarcely question the fact that the eucalyptus exercises a potent influence in preventing the spread of malarial diseases, and if the attention of our people generally can be once drawn to the importance of its extensive cultivation, especially in districts where malarial diseases prevail, we may anticipate most important and beneficial results.

We might adduce many more evidences of the value of the eucalyptus, not only as a remedial agent, but for fuel timber, as a shade tree, as a protection to orchards and vineyards against the force of winds and the depredations of insect pests, and as a gatherer and dispenser of moisture; but we think enough has been said to convince the most skeptical of its value. When our agriculturists, horticulturists, and vine growers can be brought to understand that their best interests require them to study and practice collectively the all important triad—irrigation, drainage, and forestry—we shall no longer be called upon to write papers upon the subject of irrigation as an agent in the induction of malaria.

BACTERIOLOGICAL RESEARCHES ON YELLOW FEVER IN HAVANA.

By Charles Findlay, M.D., of Havana.

Every true lover of science must hail as a happy event for the furtherance of the bacteriological study of yellow fever, the visits made by Dr. G. M. Sternberg to Brazil, Mexico, and Cuba, for the purpose of determining whether the results of previous investigators, who claimed to have obtained characteristic colonies from yellow fever products, deserved to be considered as scientifically demonstrated.

Two courses were open to Dr. Sternberg for the fulfillment of his task: Either to verify the results by repeating the experiments according to the same methods employed by the original investigators, or to substitute a technique of his own, more in accordance with the improved systems of bacteriology, and to demonstrate the fallacies which the previous researches had been liable to. Dr. Sternberg has chosen the latter, perhaps the only one which his limited time would allow. By this plan, he has shown that the results announced were not obtainable by his own more accurate methods, and his judicious criticism has convinced us that our own *technique* had not been sufficiently precise to warrant definite inferences. Whatever disappointment this demonstration may have caused, has been, however, fully compensated by Dr. Sternberg's courtesy in making us acquainted with his own admirable methods of investigation, thus enabling us to test for ourselves our previous experiments.

In August, 1886, I undertook, in collaboration with my friend, Dr. Delgads, to inoculate blood and blister serum of yellow fever patients in sterilized agar-agar jelly, having failed to discover in those liquids any micro-organism directly recognizable under the microscope. For this purpose the finger of the patient was washed with soap and water and then with strong alcohol, after which it was pricked and the blood directly inoculated in the jelly by means of a sterilized platinum needle. The blister serum was obtained by means of a cantharidine solution in collodion, the skin having been previously washed with soap and water, alcohol, bichloride solution, and again with alcohol. After twenty-four hours the needle was introduced into the unbroken blister and directly inoculated into agar-agar jelly. By this means we obtained in a fair proportion of cases yellowish-white colonies at the point of inoculation and along the track of the needle, sometimes combined with another orange-yellow colony. Under the microscope we found the colonies to be composed of micrococci, variously grouped. Inoculations in dogs, rabbits, and guinea pigs gave no evidence of pathogenic properties; but similar white colonies were obtained on the fourth and fifth day from blood and blister serum of the inoculated animals, and, strange to say, the same white colony resulted, whether the animal had been inoculated with the white or with the orange-yellow colony.

After continuing our successful experiments until October of that year, we failed in all our attempts during the succeeding months until the following June. We had noticed, moreover, that the results were always negative when we attempted the same cultures from patients presenting suppression of urine, or symptoms of uræmia. The same restrictions and interruptions were likewise observed by us the following year.

In June, 1887, we again obtained our white and orange-yellow colonies, and, moreover, ascertained that the white was characterized by the tendency of the micrococci to form tetrads, either simple or compound, and which often carried irregular chains of three or four elements appended to one or more of their angles. Inoculations upon rabbits and guinea pigs again gave negative results. We were able to verify the presence of tetrageni in some twenty cases of yellow fever, between the months of June and November of that year, and on revising our cultures of the previous one the tetrads were also found, as also in two cultures from the kidney and liver of an autopsy made in 1886.

Some control-experiments upon healthy, non-acclimated subjects gave negative results, with one exception, which afterwards proved to have been in the period of incubation of a severe attack of yellow fever, which manifested itself eight or ten days later.

We sent specimens of our cultures to Prof. Welch, of the Johns Hopkins University, and to Dr. G. M. Sternberg, who both verified the presence of tetrageni in our cultures, though apparently of different varieties and mixed in most cases with bacilli, some of which liquefied gelatine. In the meantime Dr. Matienso, of Vera Cruz, had likewise obtained cultures from yellow fever products, and in one instance observed a tetragenus.

Dr. Gibier, on examining our cultures, did not admit that they were typical tetrageni, but averred that they were morphologically identical with Dr. Freire's. There is, however, this difference, that Dr. Freire's cultures liquefy gelatine, whereas my own, in pure cultures, do not.

Dr. Sternberg failed at Rio Janeiro to obtain any cultures from specimens of blood collected by himself from yellow fever patients; but from samples which had been collected for him, and according to his own method, by Dr. Arango Goes, he obtained a yellow colony consisting of a large micrococosm in tetrads, like some which he subsequently found in my own cultures.

Finally, Dr. Sternberg made a number of experiments and surface cultures in Rio, Vera Cruz, and Havana, by which he satisfied himself that yellow fever patients, as also some of the other inhabitants of yellow fever countries, habitually present upon the surface of their skin micrococci in tetrads.

These coincidences appeared somewhat remarkable. On the other hand, having practiced since 1881 several successful inoculations by means of contaminated mosquitoes, as described in the "American Journal of Medical Sciences" (October, 1886) and elsewhere, we ascertained that mosquitoes which had been made to sting yellow fever patients, and afterwards were inclosed in phials containing sterilized agar-agar jelly, developed colonies of tetrads like those which we had obtained from yellow fever products.

In spite of these results, Dr. Sternberg's objections to our methods of investigation, coupled with his assurance that no evidence of tetragenous germs had ever been found either in the blood or tissues of yellow fever subjects, examined according to approved methods, induced us to accept as a plausible explanation, that our cultures might have proceeded from surface germs; provided, of course, that the experiments which Dr. Sternberg was about to undertake should confirm his previous experience.

During his stay in Havana Dr. Sternberg limited his researches to cadaveric products. He performed, as stated in his communication to the Havana Academy of Medical Sciences, ten autopsies upon yellow fever subjects, within from two to five hours of their death, and with the following general results:

Heart Blood.—In two cases colonies of bacillus (*a*) were obtained, in the other eight the results were negative.

Urine, collected in the bladder. Three cases gave colonies of different bacilli, and seven proved sterile.

Kidney.—In six cases micro-organisms were developed, four remaining sterile.

Liver.—Three cases gave colonies of bacilli, and seven were sterile.

Contents of Stomach and Intestines.—In eight of the ten cases bacillus (*a*) was found present.

Finally, in three cases, pieces of liver and of kidney were soaked in bichloride solution (1 per cent), then kept forty-eight hours wrapped in muslin or tissue paper saturated with the same solution. At the end of that time cultures were made from the interior, where the bichloride had not reached. In one of the three cases both the liver and the kidney gave colonies of large micrococci in tetrads like my own, besides others in short chains and a liquifying staphylococcus. An Esmarch tube, prepared by Dr. Sternberg from these micrococci, and which he kindly left with me, presented very characteristic isolated colonies, from a single one of which I obtained a small bacillus growing into a spirillum, and also micrococci in tetrads and in short chains.

This last result of Dr. Sternberg's researches certainly shows that tetragenous germs do find their way into the tissues of yellow fever patients, and it is quite possible that they may have existed in other cases likewise, and that the failure of bringing them into existence may be due to our ignorance of the measures best calculated to do so.

It behooved us, therefore, to resume our former experiments upon the blood and blister serum, with such modifications as might exclude the sources of error to which our attention had been called. We therefore adopted the following plan for collecting our material:

Finger Blood.—1. The finger having been carefully washed with soap and water and with absolute alcohol, by means of sterilized rags or cotton, a *surface culture* is made according to Dr. Sternberg's method (a couple of drops of sterilized bouillon are expelled from one of his bulbs, and after rubbing the skin with the capillary joint, the expelled portion is allowed to reënter the bulb, and the latter is again sealed).

2. The finger having been pricked with a sterilized needle, at the spot where the surface culture has just been made, the blood is collected in dry bulbs. The blood is also directly inoculated into solid agar-agar jelly.

3. The same finger is then washed with alcohol, then with bichloride of mercury (1 per cent solution), and finally with absolute alcohol, and a second surface culture is taken.

4. The spot from which this second surface culture has been taken, is again pricked and the blood collected in sterilized bulbs, or inoculated directly into solid agar jelly.

For Collecting Blister Serum.—The following articles are prepared beforehand and kept in bichloride solution (1 per cent) until required for use: Two rubber rings of four and six centimetres, respectively, inner diameter; a square piece of oiled silk; a square piece of muslin. The patient's arm having been carefully washed with soap and water, bichloride (1 per cent solution), and again with absolute alcohol, four small dots are marked on the skin to limit the space where the blister is to be applied. Four layers of cantharidine collodion are then applied; the smaller rubber ring is placed around the blister; the oiled silk over the ring; the larger ring over the silk, and the muslin compress over the whole. A broad band of adhesive plaster fastens the dressing upon the arm, and a wire shield protects the blister. After twenty-four hours the dressing is removed and the serum collected from the *unbroken* pouch in sterilized bulbs, or used to inoculate solid agar jelly.

This technique was strictly adhered to in the case of a soldier in the fourth day of fatal yellow fever, occupying bed No. 46, fifth ward, of the Military Hospital, in Dr. Rivas' charge, on the twenty-seventh and twenty-eighth of June. The results were as follows:

1. *Surface Cultures.*—Both the cultures prepared *before* and *after* the skin had been washed with bichloride remained sterile, showing, after the lapse of thirteen days, absence of surface germs at the spot where the blood was collected.

2. *The Blood before the Application of the Bichloride.*—(*a*) Of two solid agar tubes inoculated directly from the finger blood, one gave a white, creamy colony on the fifth day, consisting of a micro-organism in tetrads and short chains, the other remaining sterile. (*b*) The blood collected in sterilized bulbs was used the following day to prepare a gelatine Esmarch tube, which was thought to have remained sterile, but a cloudiness was observed, composed of innumerable dots (colonies?), from which a new tube has been inoculated.

3. *Blood after the Application of Bichloride.*—(*a*) Two tubes of solid agar jelly inoculated directly from the finger blood have remained sterile. (*b*) The gelatine Esmarch tube, prepared with two or three drops of blood collected in a sterilized bulb, produced a number of isolated colonies, some of which were inoculated in agar; but later on, the gelatine having melted with the heat, a sediment, partly white, partly yellow, settled at the bottom, and new cultures were obtained from the latter.

4. *Blister Serum*—(*a*) The two tubes of solid agar, directly inoculated from the blister serum, remained sterile. (*b*) A gelatine Esmarch tube prepared with two drops of pure serum, five hours after collection, produced a number of isolated colonies, mostly of a yellowish brown, with smooth edges, but a few were somewhat lobate. After awhile a whitish semi-fluid film formed over the gelatine. Separate cultures were made from this film. Finally the gelatine was liquified.

With the exception of the direct culture in agar jelly from blood *before* the application of bichloride, and which gave only a micrococcus in tetrads and in short chains, like those obtained by us last year, the other cultures from the blood *after* the bichloride application, and from pure blister serum, gave micro-organisms of two, or possibly three, different kinds.

1. Micrococci in tetrads, intermixed with some in short chains, similar to those obtained by us in 1887.

2. A small bacillus, not unlike Dr. Sternberg's bacillus (*a*) when single, but generally occurring in short chains, agreeing in every respect with the description of Babés' *chainettes*. The specimens derived from the blood culture are somewhat more slender than those from the blister serum, and resemble more closely the chains contained in the kidney section prepared by Dr. Sternberg from specimens in Dr. Lacerda's collection, and which he was kind enough to give me. In drop cultures the short bacillus is seen to be knobbed, and is quite mobile. The short chains are also knobbed, and the larger ones present several articulations or joints which are quite independent of the knobs; the latter corresponding to the stained portions of the dry specimens. In some of the filaments false branches appear, both in the moist and dry preparations, suggesting the idea of a clodothorix.

3. A preparation from the semifluid film, which formed over the surface of the gelatine Esmarch tube, prepared from pure blister serum, showed typical tetrads like those observed in the blood, and also Babés' *chainettes* and branched filaments (clodothorix?). Most of the filaments or *chainettes* were found to carry along their sides or at their extremities colored grains (spores?) variously grouped, some in regular tetrads, and which could not be morphologically distinguished from the other cocci in tetrads, seen in the same preparation.

A rabbit received by an intra-peritoneal injection three centimeters of a bouillon culture of the bacilli, which I call "*Babés' chainettes*," without any pathogenic manifestation.

The above results are given merely to show that our tetrageni in this instance could not be attributed to surface germs, and that it is yet possible that one or several of the micro-organisms pointed out by previous observers and by Dr. Sternberg himself, may be found to play an important part in the etiology of the disease.

Since writing the above, Dr. Delgads and myself performed, on the thirty-first of July, an autopsy, three hours after death, on a subject who had died in the third day of yellow fever at our Military Hospital. The juices from the liver, kidney, and spleen were collected in Sternberg bouillon bulbs, with the necessary precautions, cultivated in semi-fluid gelatine at 30 degrees to 32 degrees C., and from the whitish sediment that formed after forty-eight hours, agar Esmarch tubes were prepared. Round, pale, straw-colored colonies, with smooth edge, were obtained from the three organs; they consisted of our micrococcus in tetrads and short chains.

Pieces of liver, kidney, and spleen were soaked in (1 per cent) bichloride and wrapped in cloths steeped in the same solution. After forty-eight hours cultures were prepared from the kidney and spleen, and also direct stick cultures made in solid agar jelly. The piece of liver was beginning to decompose and was, for that reason, discarded. From the kidney, both the direct inoculation and the Esmarch tubes gave our micrococcus in tetrads and short chains. The direct inoculation from the spleen also produced the same microbe, but the germs failed to develop in the Esmarch tubes, the bichloride, perhaps, diffused too freely in the substance of the organ, thereby impairing the vitality of the micro-organism.

The colonies from stick culture in solid agar are at first white with a slight yellow tinge, but as they grow older the yellow color becomes more distinct, though varying in intensity in different samples even from the same source.

Not having found, in this instance, any trace of the bacillus in short chains, resembling Babés', described above, we infer that their presence in the former case may have been due to a "mixed infection" which, we believe, generally occurs in *melanic* cases.

Inoculations in rabbits and guinea pigs with pure cultures of our microbe have hitherto given negative results. We have also tried them upon ourselves and upon two non-acclimated subjects in Havana. In Spain, Dr. Ferran, of Barcelona, to whom we had sent samples of our old (last year's) cultures, tried upon himself and upon his assistants subcutaneous injections, and swallowed liquid cultures from our own. The results have so far been negative. We purpose, however, resuming our experiments with our fresh material, for it is possible that, notwithstanding their inefficiency to produce immediate pathological manifestations, such inoculations might confer immunity.

So far we have only succeeded in reproducing the disease by the somewhat irksome process of our "mosquito inoculation," as described in the "American Journal of Medical Science" (October, 1886). During the present year we have only applied the process to one person, employing two infected mosquitoes. A mild attack of non-albuminuric yellow fever resulted after twenty-one days' incubation. None of the persons so inoculated, in the course of the last seven years, have been subsequently attacked with yellow fever after the first mild manifestations which followed the application of the mosquitoes in about one fourth of the cases. Of the others, which had shown no immediate effects, some have subsequently had a mild attack, but no fatal case, and only two albuminuric have been recorded among the thirty subjects or more in whom the applications had been made during the summer months, and according to the conditions which we have repeatedly indicated (absence of uræmic or typhoid symptoms, and limits between the third and sixth days of the disease in the patient from whom the insects are contaminated).

Believing as we do that mosquitoes are the habitual agents of transmission of yellow fever, we recommend that patients attacked with the disease should be protected, as far as possible, against the bites of those insects, in order to check its propagation to others. Perhaps some local application, such as quinine in alcohol, to the uncovered parts of the body might be useful for that purpose.

CUBA IN ITS RELATION TO THE SOUTHERN UNITED STATES; ITS DANGER AS A DISEASE-PRODUCING AND DISTRIBUTING CENTER.

By Wolfred Nelson, C.M., M.D., member of the College of Physicians and Surgeons, Province of Quebec, Canada; late Board of Health, State of Panama, South America; correspondent State Board of Health, California, etc.

Ere considering the City of Havana and its surroundings, climate, and past history, I shall commence by describing the Military and Naval Hospital there. It lies within the city proper, and is an immense building, built of stone, originally intended by the Spanish Government for tobacco warehouses, at the time when the Government controlled that vast business. Later, when the control ceased, the Government had the building fitted for a huge military and naval hospital.

It is two stories high. Perhaps the better way to convey an idea of its vastness will be by stating that, mainly on the upper floor, are sixteen hundred beds. There are military and naval wards, wards for the insane, smallpox, etc. The military and naval wards are subdivided into medical and surgical sections, and have their own staffs.

The wards are very large, being the full breadth of the building. They are called *salas*, or halls. Roughly, they are one hundred feet long by, say, forty feet wide, with windows on either side, with terminal rooms for the pharmacies, doctors, nurses, etc. They are well ventilated and get no end of air—such as it is—and no end of sunlight. The beds are arranged in long rows down the sides of the wards, the patients looking towards each other; thus there is a large central aisle.

With Dr. Daniel M. Burgess, formerly of the United States army and now a practitioner in the City of Havana, I visited the buildings, and, thanks to the courtesy of Dr. Fernandez, of the Spanish army, every facility was granted us for seeing things just as they were.

In a large ward containing, say, seventy patients, we saw and carefully examined seven cases of yellow fever, noting the various conditions of the patients—such as black vomit in one case, urine in another, later noticing its testing—the examination of the very full and careful clinical notes of the cases, etc. I was most careful in my mental note taking, contrasting what I saw with my five years' experience on the Isthmus of Panama, and from having seen the disease on the West Coast of Mexico in the summer of 1885, when I traced the history of the Mexican epidemic, which was published *in extenso* in the last biennial report of the Board of Health of the State of California. I may add *inter alia* that ere "doing" the Military and Naval Hospital in the City of Havana, I had spent upwards of five months in the oldest city in the Island of Cuba, to wit, Santiago de Cuba, and, thanks to the courtesy of my friends Drs. Hartman, Urbano Guimera, Ros, and Castillo, I had opportunities for studying the disease in the Eastern Department of Cuba.

In military wards yellow fever patients are placed side by side with those suffering from any illness, no distinction being made. While this may surprise those who have not had long and close relations with yellow fever, it does not surprise me in the least. "Why," say you? Failing epidemic conditions, there is practically no danger. I speak from knowledge. Again, failing the usual conditions noted in seasons of epidemic in Cuba, such as an irregular season, great heat, want of rain, etc., with a very high temperature—failing these, no new cases would develop, or so few as simply to prove the exception to the rule in Havana.

Referring to Isthmian experience, I may state that the Lady Superior of the Military and Charity Hospital in the City of Panama never knew a case of yellow fever to develop in a huge ward under her charge, a ward having one hundred and fifty beds. I simply cite this Isthmian experience to emphasize the above statement. In speaking so positively of the disease, I fall back on a close study of eight years of yellow jack and and his kindred, and from having compared notes with profound students of yellow fever in the West Indies, Mexico, Central America, and the northern end of South America, private practitioners in dozens of localities, and naval and military surgeons wherever I could meet them. As you will gather by what is to follow, that vast system of hospitals in Havana, while being thoroughly infected with yellow fever, it is an exceptional thing for a case to develop in wards, outside of the epidemic conditions previously alluded to, and despite the fact that the air that enters the building is foul-smelling, being the fœcal atmosphere noticed in all Spanish West Indian cities.

After carefully examining two of the long wards, and noting the corridors, the general cleanliness, and order, we descended the broad stone staircase to the main or ground floor of the huge quadrangle, and walked along the cloister-like passages, noting the huge storerooms on our right filled with medical and surgical supplies, etc. Here are vast quantities of stores, as this building issues them to all the hospitals, military and naval, in the Island of Cuba.

Now, then, pray remember the constant presence of yellow fever in that building; sailors from the vessels of war; newly arrived recruits from Spain; also remember the direct and wholly unrestricted communication between all parts of the building, etc.; patients, doctors, nurses, and orderlies moving about as freely as if no disease was present—in short, with absolute freedom, and, I may add, with the most perfect nonchalance. Nothing is thought of the danger—nothing. It is just as much a product of the Queen of the Antilles as her tobacco; it is so common, and such an every day affair, that it is a constant source of joking in all the theaters of Havana—a ghastly yellow joke. As a close student of yellow fever, and having seen the disease in various places, I was not surprised, knowing the indifference with which Spaniards and Cubans alike look on the disease.

If the danger of infection was confined to the building in itself my surprise would have ended there and then; but when I stop to reflect that the storerooms beneath the wards were filled with all sorts of stores, including hospital bedding, etc., it gave me food for thought. There can be no question in the mind of any student of yellow fever as to that vast hospital as a constant recipient and distributer of yellow fever. To repeat, despite the fact that the building is infected, and so to speak saturated, with the poison of yellow fever, it is an exceptional thing for a case to develop in the wards. During epidemic seasons it goes without saying that the disease has developed in the wards—the same as it does in all countries when the necessary epidemic conditions obtain. There can be, and is, no doubt in my mind that the hospital bedding, shipped about the island to other hospitals by the ordinary steamers, and by the various vessels of war, is infected; and such material or fomites, time and again, has established new foci of disease.

I can recall a limited epidemic in the fort at Caiminero, or the Port of Guantanamo. The disease broke out among a lot of new recruits, killed twenty-one of them, exhausted itself, and became quiescent. This was in the fall of 1886.

Probably but few of my readers are aware of the fact that Cuba, or the Queen of the Antilles, is almost a small island continent. Its length is seven hundred and twenty-one miles, or the counterpart of that of the coast line of California, the second largest State in the American Union. All the cities of Cuba, inland as well as on the coast, are garrison towns and ports. In the cities and towns Spanish troops will be found, and in all ports Spanish men-of-war of various classes. The main hospital in the City of Havana, in constantly supplying one and the other with stores, unquestionably is constantly creating new foci of disease. This statement I deem absolutely indisputable. Strange as it may seem, the Spanish Government does nothing, and the matter goes on as it has done during long decades, and as it will do to the end of all time (I mean Spanish time). Hence, yellow fever obtains in all the military and naval hospitals of the island, and nearly at all seasons of the year.

It is never absent in the City of Havana, there being a few cases even in the coolest weather, or when American winter visitors flock to that charming city to get an insight into things Spanish. While the City of Havana during that season is comparatively free from yellow fever, the City of Santiago de Cuba, at the opposite or eastern end of the island, always suffers most.

According to Dr. John Guiteras, of the United States Marine Hospital Service, a profound student and writer upon yellow fever, the City of Havana has had an annual epidemic for over one hundred years. July, August, and September are the fatal months of the year, and the Cubans, in their late insurrection against Spain, called those months their "Three Generals," as they had rendered them their greatest aid during the late insurrection, which lasted from 1868 to 1878, they meaning that yellow fever had swept their enemies away like chaff before the wind. During that insurrection two hundred thousand Spaniards lost their lives in the Island of Cuba, the vast bulk of them from yellow fever.

ACCLIMATION.

A word regarding an old time myth. It has been the custom of people to talk about the protecting influence of acclimation. There is no acclimation that protects against yellow fever—none. The only protection against the disease is to have experienced it. No modern student of yellow fever with whom I have the pleasure of being acquainted, whose opinion is worth citing, places one tittle of reliance in acclimation; and if that old theory needed a *coup de grace*, it has received it within the last three months in the epidemic of yellow fever that has swept the City of Sancti Espiritu in the Island of Cuba. "El Pais," a newspaper of that city, recently published the death rate, and, among other facts, stated that twenty-four children, all native born, had been swept away in a single day by *el mal del pais*, as they call yellow fever.

Now then, I ask a question: If there is anything in acclimation, why didn't it protect those native born children? And, I answer it in person, by stating, because there is nothing in acclimation.

We, as students of disease, must bear in mind that between epidemics numberless children are born, and when a new epidemic approaches they become food for it. While it is quite true that the mortality among native born children and natives is somewhat less than among foreigners, still the disease sweeps them away. And, as a collateral statement to this one, I will cite the experience of my friend, Dr. Didier, formerly a practitioner at Guadaloupe, one of the French West Indian Islands, who for a time was one of the physicians to the Panama Canal Company, while my brother, the late Dr. George W. Nelson, was Resident Physician at the Canal Hospital in Panama. He informed me, that in off seasons, or when there was no epidemic in that pretty island, the children of creoles showed no symptoms of yellow fever, but when the necessary atmospheric conditions came about (that are so intimately associated with these epidemics and yet are so exceedingly difficult to describe) such children came down with yellow fever, and while the mortality among them was less, still many died. Having disposed of that old time myth, let us return to

THE CITY OF HAVANA.

The City of Havana and the Island of Cuba generally, is a constant producer and distributer of yellow fever, and by her geographical position and nearness (ninety-four miles to Key West, Florida), and with almost daily steam communication, she is a constant source of danger to all ports trading with her, particularly to all ports having almost identical climatic and geographical conditions. I refer particularly to Florida, Louisiana, and Alabama, bearing in mind their heat, their moisture, swamps, etc. Just so long as Spain neglects her duty, just so long will Cuba be a constant source of danger to all doing business with her; and, as seven eighths of all her exports come into the United States of America, the danger to the said States is greater than for countries receiving her goods after many days' travel. And even they are exposed. A limited epidemic of yellow fever in England in the fall of last year, was traced to a brig—copper-laden, from Santa Iago de Cuba—as may be gathered from my article in the last report of the State Board of Health, State of California, 1886. The constant source of peril is to the ports of the Southern United States. In May last, I left the City of Havana for New York. Upon getting upon the steamer "Hutchinson," of the Morgan Steamship Company, I noted among the steerage passengers a lot of filthy humanity—Turks. I also noted the careful way in which they were inspected, individual by individual, by Dr. Daniel M. Burgess, the Inspector of the United States Marine Hospital Service in Havana. These Turks were wholly unacclimated; that is, they had not had yellow fever. They had been spending some six weeks in the City of Havana, peddling and living in the slums of the city. As stated, I was present at the examination of these people, and they left the City of Havana in excellent physical condition, as far as the eye could judge. We sailed from Havana on the seventh of May, and as the quarantine season at Tampa, Florida, was not in force, the company could not refuse the sale of tickets. At that very time there was much yellow fever in the lower part of the city. On our way to Florida, I kept my eyes on these people, fearing that yellow fever would develop and that we should be detained on making the mouth of the Mississippi. They were an exceedingly filthy mass of humanity—men, women, and children—clad in rags.

On reaching Key West I saw my friend Dr. J. Y. Porter, the able President of its Board of Health, who came down to the steamer, and I directed his attention to them as a source of danger to any port at which they might land. As they were going beyond Key West, of course he had nothing to do with them. No passengers were allowed to debark there.

I stepped off on to the pier and was ordered back on the steamer. This was absolutely correct, and in strict keeping with what we know of keeping out yellow fever. Still, I noted the landing of many baskets of fruit covered with coarse matting that had been shipped from the lower part of the City of Havana, from spots noted for their foul odors and disease.

Among my fellow passengers it was my good fortune to meet Dr. J. W. Ekens, a retired practitioner, from Yorkshire, England. While he had had no experience with yellow fever, he had had a most extensive experience as a Health Officer in Yorkshire, and he fully agreed with me as to the danger lurking in such forms, that is, unless scientifically disinfected, *a la* Holt.

At Tampa, Florida, I sent a line to my friend Dr. John Wall, a profound student of yellow fever, and the President of the Board of Health there. At Tampa, Florida, the Turks went off in a small tender. Subsequently, I learned that Dr. Wall did not receive my letter until another steamer came in three days later, from Havana, when it and a letter from Dr. Burgess reached him together. Dr. Burgess wrote that he had learned that one of that same band of Turks had died of yellow fever in Havana early in May. Had my letter reached Dr. Wall in time he would have been powerless, as the quarantine was not in force. Immediately upon receipt of our letters he had the people hunted for, but they had gone to various localities. Upon getting to New Orleans I read my pencil notes to my friend Dr. Joseph Holt, whose Ideal Quarantine at the mouth of the Mississippi is the admiration of all writers and students of sanitary science. Dr. Holt took instant action, and notified the Government of Florida, and the Turks were hustled out of that State, *but not before one of them had died of specific yellow fever in Plant City, about the end of May or beginning of June.* This I subsequently learned in November, 1887, from my friend, the able President of the Jacksonville Board of Health, Dr. Neal Mitchell. I was then en route to Tampa, to see the yellow fever in that city. Hence my warning had not been in vain regarding those Turks. The Tampa epidemic I shall refer to later on. I simply refer to those Turks collectively, as an illustration of the dangers of rapid transit—rapid transit to benefit a steamship line and a few railroad magnates, a transit that has done the State of Florida more or less of damage by the yellow fever now raging there. After visiting Tampa last fall, and finding that my friends Dr. John Wall and Dr. J. Y. Porter were unjustly opposed by conscienceless individuals, I sent the Jacksonville "Times-Union" a letter, calling the disease yellow fever, properly so called, and warned the State *that this year it would be upon them.* (See "Times-Union" of November 30, 1887.) This rapid transit means that thirty hours after leaving the City of Havana one is in the City of Tampa, and ten hours after leaving Havana one is in Key West, an island of the Florida group.

Perhaps it will throw some light on this matter, if I state that I have seen a good deal of the Southern States. I refer to Florida, Louisiana, Alabama, etc. My trips to the South have been six in number, including two months spent in Louisiana, Florida, and Alabama, where I made my own observations and exchanged views with many veterans who have faced yellow jack in the field. During my visits to the Sunny South I added to my small knowledge of yellow fever by culling all that I could from many confreres with whom I was brought in contact. I also noted the geographical features, particularly of Florida, Louisiana, and Alabama, and saw all that was necessary to explain to my mind why yellow fever has so swept them in times past. As already stated, I noted very particularly the swamps, heat, excessive moisture; in short, each and all of the conditions that extended a constant and generous welcome to yellow fever germs. I say germs.

Again let us return to the Military and Naval Hospital. Leaving the storerooms, a polite orderly took us along the cloister or corridors made by the Moorish arches and stone floors, across the central court, or *patio*, of the huge building, past trees and luxuriant vegetation, and a wealth of flowers, the whole making a most effective contrast against the whitewashed walls of the building. On we went, past all this pleasantness, finally passing below a stone arch, past the wards for the insane, and into an open space back of the main building. I mean the sea face of the huge quadrangle, and we stood facing an upper arm or horn of the Bay of Havana. The rear walls of the building are within say one hundred feet of the seawall. To the right we passed the dead-house. We were told that often there were seven or eight corpses in it at one time. It is within a few feet of a very narrow and dirty lane, on which faces a vast warehouse for sugar, of course, for export. The great bulk of the sugar goes to the United States of America. In connection with sugar let me say to the students of yellow fever that the favorite method of shipping sugar is in sacks. Could better fomites be found.

Passing from sweet to other themes, we will now consider the hospital closets. They project in part over the water; they are quite as foul smelling as one would expect under a tropical sky. The seawall is of a soft coralline stone, so soft that the masons may be seen shaping it with their broadaxes. The rise and fall of the tide is practically *nil*. It is hardly necessary for me to dwell on what may be expected from soft porous stone, almost spongy in texture, constantly surcharged with fœcal matter from the huge hospitals now under consideration. The water there is very shallow, in some places but a few inches deep. Need I describe it to you? Within one hundred and fifty feet of the closets, *the light draft American schooners* discharge and receive cargo, anchored for days together in the foul waters of that part of the harbor, waters that practically are never changed.

Having carefully noted each and all of the conditions, the position of the shipping, and the hospitals and buildings, we again retraced our steps, passing cloister after cloister, past several wards filled and partly filled with patients, and reached the main entrance, where we said *adios*, or farewell, to the military orderly who had shown us over the building and premises. We then passed along the main front of the building, and turned down the narrow, dirty street to our left, following the hospital walls on past the dead-house and closets already described, and stood on the wooden pier, looking directly back on the spots just referred to.

At the end of the pier was the American brig "Hyperion," of Philadelphia, discharging coke, certainly not two hundred feet from the closets. Dr. Burgess pointed out another pile of coke just discharged by another vessel, that having laid alongside the pier instead of at its end, like the "Hyperion," had been bow on to the closets, and within one hundred and fifty feet of them. Remember the vessels and their vicinity to hospitals, etc. Frequent cases of yellow fever appear in these vessels, and they return with cargoes of sugar to American ports, the whole constituting a constant source of danger, particularly to the Southern United States.

The hospitals lie at the upper end of this arm or horn of the bay. There are many slaughter houses there whose blood, refuse, etc., is added to the perpetual nastiness thereaway. Dr. Burgess informed me that at times enough blood ran into the horn to color the waters a bright scarlet. A small river, so called—a mere rivulet—empties into the horn, but its waters, except during the wet or rainy seasons, are so scanty as to be of no value for flushing purposes. We must bear in mind that the rise and fall of the tide there is very small, being identical with that of another pestilential and death-dealing center. I refer to Colon, the Atlantic city of the Isthmus of Panama, a city whose conditions I described at length in the last biennial report of the Board of Health of the State of California. (Refer to my article on "Yellow Fever in its Relation to the State of California.")

The piers along that waterfront are wooden. Where seawalls exist, they are of the soft. porous coralline stone already described, the whole eminently fitted to entangle, retain, and foster low forms of vegetable life and the germs of disease. I say germs of disease.

We walked along past huge sugar warehouses, Spanish gunboats, and shipping of all nations, towards the city. If the waters are foul at the upper horn, where the warehouses are, you can fancy what they are just near the narrow entrance to the harbor, where drains pour in their reeking contents directly amid and under the very bows of the ships as they lie stem on at the piers. They lie stem on for want of room. A large fish market contributes its due share of filth. Literally, "it smells unto Heaven."

The City of Havana has a population estimated at two hundred and four thousand. It is but partly drained. Old-time privies and cesspools poison the air and soak the earth with fœcal poisons. Its whole subsoil is contaminated. When in Havana, in November of the year previous, I purposely visited the docks near La Machina, in the vicinity of the Custom House, where the entrance to the harbor is narrow, and where the vessels for want of space lie side by side, as already stated. There I noticed that in the dirty waters occasional bubbles arose to the surface to discharge their foul gasses, telling of fermentation far below. In the very thick of this sewage the vessels and the sailing ships are found. In them yellow fever makes constant ravages at all seasons of the year, particularly in the hot months. We owe much to commerce and rapid transit. We are also indebted to it for epidemics of yellow fever. With proper sanitary precautions the Southern United States would be free from all future epidemics of yellow jack. But will they be? I doubt it. Why? Because "corporations have no souls to damn and no backs to kick," and because mankind is selfish and grasping in the search for riches.

The entrance to the harbor of Havana requires special mention. To place this word-sketch before you clearly, let me give full details. The entrance to the harbor may be six hundred feet across. The harbor may be described as a small inland salt lake, perhaps a mile and a half or two miles long, by three fourths of a mile across in its broadest part. The entrance to the harbor is guarded by the old-time historic fortifications called El Morro. Just opposite, or across the entrance, are other fortifications, covered with huge siege guns, on the city side. Remember, the narrow, gatelike entrance, a mere water lane, and beyond the harbor, receiving all the filth and sewage mentioned. As one would expect, who has traveled in the West Indies, Mexico, Central and South America, and Havana, owing to the old-time closets, want of drainage, subsoil contaminations, etc., the city is a disease-producing and distributing center; the air in certain sections reeks with the vile fœcal odor so familiar to all travelers in Spanish-American cities within the tropics. Huge street gratings ventilate the few drains, and the reeking odors almost stifle one in the crowded centers. These drains are never flushed except by the heavy rains, and if flushed would only empty their fermenting contents into the bay below.

A mere reference to fœcal fermentation within the tropics, to all students of disease is ample, without entering into specific details. I may add *inter alia* that there are some students of yellow fever who believe—and undoubtedly their belief is a just one—that the fœcal matter from all such yellow fever patients is as essentially dangerous as are the stools from typhoid patients.

The point I wish to make, and impress upon my readers, is this: That the poison of yellow fever is just as much a part and parcel of the City of Havana, as the houses and churches of New York are a part of that noble city. I make bold to state that the yellow fever poison is as much an article of export from that island as are its famous cigars. While the harbor is foul and dangerous, the city is the habitat of yellow jack.

So much for my reflections, hurriedly jotted down in pencil, on the steamer "Hutchinson," amid passengers and squalling children, and now rapidly dictated to a stenographer.

There is one fact to be borne in mind in connection with this subject of yellow fever, and it is this: the constant war by steamship agents and railroad men against all medical men who have the courage of their opinions, and dare to tell the truth. Alas, they duly recognize the value of Sidney Smith's old trueism, "Corporations have no souls to damn, and no backs to kick;" and while they are endeavoring, as they are in duty bound to do, to warn their fellowmen, to protect themselves against this dread disease, steamship agents, officers, etc., are bulldozing Consuls and doctors to obtain clean bills of health. *They lie fluently and ably, because they are paid to do so.* But when, through their criminal action, disease has been grafted on a port, they flee, and medical men are left to face the danger.

In concluding this somewhat lengthy article, it does seem to me, as a student of this awful disease, that if people wish to suicide, they should have their own way; but that they should be allowed to sell their products, and ship their disease to other countries, is manifestly a gross injustice to their fellowmen, *and an insult to sanitary science.*

A time may be coming when international law will grasp this huge problem, and say to calloused countries like Spain: "If you are willing to have your subjects swept away by yellow fever, as a direct result of your gross and criminal carelessness, well and good; but you shall not trade with me, and expose me and mine to epidemics of yellow fever, as you are doing, as you have done, and as you will do, to the end of all time, if left to your own devices."

THE PRESENT TENDENCY TO EPIDEMICS.

By Wolfred Nelson, C.M., M.D., member of the College of Physicians and Surgeons, Province of Quebec, Canada; late of State Board of Health, Panama, South America; Correspondent State Board of Health, California, etc.

In August, 1886, while in the City of Mobile, Alabama, I wrote thus: "What significance has the present tendency of disease to take on epidemic character?"* That question was asked at the time, when a vessel from Colon had made the mouth of the Mississippi with yellow fever on board. She was ordered to Ship Island.

I also wrote: "The value of quarantine is fitly illustrated by the following from the 'Telegram,' of Mobile, of date August 21, 1886: 'During the present month some six or eight ships have arrived at Ship Island quarantine station, which either contained members of the crew sick with yellow fever or had lost men on the passage from Colon by that disease. By carefully isolating the quarantine station from the mainland, and keeping all communications closed, the physician in charge has prevented any spread of the disease. These cases were undoubtedly yellow fever of a virulent type—the type of the Isthmus of Panama—and the confinement of the disease to the station is one more evidence of the benefits of a strict quarantine, remote from crowded communities. Had these ships been allowed to come up the Mississippi to New Orleans, there is every reason to believe that ere this, with so many cases of possible sources of contagion, an epidemic would have developed. As it is, New Orleans and the entire coast is enjoying excellent health, and the yellow fever at quarantine is disappearing gradually with the convalescence of the patients.'"†

Again, to quote from the same source, page 239, apropos of the above: "Acting Surgeon-General Stone, of the Marine Hospital, Washington, in his recent report of the nineteenth of August, referred to the vessels now in quarantine, and said there was no danger of the disease spreading." *And there is none if the isolation is real and absolute.*

The words in italics are my own, and will be found in the paragraph quoted from that report. Now, then, what resulted? To condense an immense amount of published matter, I may state that the isolation was not *real;* neither was the quarantine *absolute*. Boats did pass between the shore and the vessels, and the result was an outbreak of yellow fever in the town of Biloxi, Mississippi. Biloxi is one of the coast towns. I was in the State of Louisiana at the time, and was present at several meetings of the Board of Health, called in the City of New Orleans to consider that very outbreak. That it was yellow fever was most emphatically denied by doctors of great and no repute at all. Still the people sickened and died, and but for the energetic and most effective measures instituted by the Board of Health of the State of Louisiana, the disease would not have been encircled and stamped out as it was. Dr. Joseph Holt visited Biloxi, and, thanks to him, the disease did not reach New Orleans.

As usual, ignorant and untruthful physicians were haggling as to what it was, while people were sickening and dying. Between that outbreak in

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*See Ninth Biennial Report, State Board of Health of California, 1886, page 229.

†See Ninth Biennial Report, State Board of Health of California, 1886, page 228.

September and October the seventeenth, or in a little over five weeks, over three hundred cases of fever were reported, with a total of eighteen deaths from all causes. Many of the cases were true specific yellow fever, properly so called. I make this statement upon the authority of gentlemen well versed in yellow fever, whose diagnosis was positive, and it was confirmed in several cases by black vomit, were confirmation necessary.

Now, to repeat, if there is one thing well known to the merest tyro in yellow fever it is that yellow fever never has appeared in any spot, city, or on board ship but that the disease has been traced to an infected individual or infected clothing; in short, that there was an absolute introduction of the specific poison of yellow fever.

The quarantine that existed at Ship Island, Mississippi, was but a quarantine in name. Had it been real, efficient, effective, the disease would never have been taken from those infected vessels into the town of Biloxi, and have led to the circumscribed epidemic already referred to.

Again, dwelling upon the present tendency to epidemics, I shall refer to the epidemic of yellow fever in Key West, Florida, in 1887. In my article, under the title of "Cuba as a Disease Producing and Distributing Center," that appears in this issue, a reference will be found to Key West and its immediate proximity to the early home of yellow jack, I mean the City of Havana. During the summer of last year yellow fever swept Key West, killing a number of citizens and causing the direst consternation. Hundreds fled, leaving in any sort of a craft capable of conveying them to the mainland. The course of the disease there was just what one would expect who is familiar with it; it exhausted itself and then became quiescent. I repeat, quiescent.

After leaving Tampa, Florida, early in December of last year, I paid Key West a flying visit and gathered some information regarding the history of that epidemic I learned that it had been directly traced to a lot of bedding, and that said bedding had been used in a boarding-house in the City of Havana, and that there had been a death in that boarding-house from yellow fever. Later, its proprietor left Havana for Key West, taking her bedding and furniture with her. In her new home a case of yellow fever appeared. It needed but a spark, the magazine was full, and there was an explosion of the disease. The linking of cause and effect, in this simple way, emphasizes my early statement—in fact, not mine, but that of all students of yellow fever—that all cases and all epidemics of that dreadful disease can be traced to patients or fomites.

At a later period during the summer, after Key West had had her experience, a case of yellow fever appeared in Tampa. It was during the absence of my friend Dr. John Wall, the President of the Board of Health of Tampa. My readers will not be surprised to learn that an earnest effort was made to hush the matter up, and suppress all information. Interested parties lied, as interested parties generally do under like circumstances. Later more cases appeared, when it transpired that a smuggling schooner had brought the disease in from Havana. One case simply led to others, and when Dr. Wall got back he found a number of typical cases of yellow fever. As a profound student of the disease, and as a truthful and honorable physician, he grasped the gravity of the situation, and, seeking the greatest good for the greatest number, ordered all to leave who could get away; and to his care, prudence, and foresight hundreds to-day probably owe their lives.

Soon there was the usual explosion of the disease, when it took on epidemic proportions. I reached Tampa late in November. I visited it purposely to see what yellow fever in the Southern United States was like, and to compare it with what I knew of yellow fever within the tropics. Thanks to my friend Dr. Wall, I saw case after case in the city and suburbs of Tampa, and, thanks to the courtesy of my friend Dr. J. Y. Porter, President of the Board of Health of Key West, Florida, then in charge of the yellow fever hospital at Tampa, I saw his patients and the notes he had taken on their cases. In short, during my brief visit to Tampa, I had every facility given me for seeing things exactly as they existed. I asked my own questions, obtained my own information, examined patients one by one, and obtained all the knowledge that I wanted regarding the nature of the disease in that city.

Despite the fact that yellow fever had swept the city, that dozens had died—the majority with black vomit—still there were those who questioned the knowledge and accuracy of the diagnosis made by Drs. Wall and Porter, and such was the bitterness against Dr. Wall for his truthful course, that I wrote a letter to the "Times-Union," of Jacksonville, indorsing all that they had said regarding the disease, and stating that it was yellow fever, properly so called. I also warned the people of Florida against "what assuredly awaits them next year." That letter appeared November 30, 1887. Now this may seem a remarkable statement, that a foreigner should deem it necessary, in the interest of the exact truth, to come out in the local press to indorse the statements of two well known professional men, whose position socially and professionally is of the highest; but it simply illustrates what willful ignorance and "the cursed love of gold" will lead conscienceless individuals to do—I mean a contemptible war upon truthful physicians, who staid in the field and fought the enemy while their cowardly accusers fled the field. In Tampa I saw and noted the condition of the city, its surroundings, the elevated temperature, and felt sure that the disease would be kept alive during their winter, so called—Tampa is below the frost line. Owing to the panic and fear, the houses had not been disinfected, and the stoves in them would keep up the necessary temperature to keep the germs alive awaiting the return of the summer days, when they would again be ready to continue their deadly mission. This summer there are many cases at Plant City, a few miles from Tampa. Cases were reported at Manatee. Local physicians denied that they were yellow fever and roundly abused Dr. Wall. After there had been seven cases he was sent for, and as he stood by the side of a woman dying of specific yellow fever, even then a physician questioned its being yellow fever. Later, when there had been more cases, they reluctantly admitted that Dr. Wall was right. In Plant City such was the feeling against Dr. Wall that he was burnt in effigy, and threats and no peace were his portion. Later they reluctantly admitted his wisdom.

On the third instant (August, 1888,) I left Havana per steamship "Mascotte," for Key West and Tampa. In Key West I saw Dr. Porter, and in Tampa Dr. Wall, when we discussed the situation freely. I then went on to Jacksonville, and learned from my friend Dr. Neal Mitchell, the President of the Board of Health of that city, that some days previous to my arrival there had been a suspicious case of sickness at the Grand Union Hotel, in that city. The patient was not his, but owing to the presence of yellow fever in South Florida, the hotel people became suspicious and sent for him. Dr. Porter was then on a visit to Jacksonville, and together they saw the case. It was pronounced yellow fever. The man was removed to the hospital at the sand hills, outside of the City of Jacksonville. Later other cases followed, and, as I had predicted, it took on epidemic form, and in that form it is prevailing to-day (August thirtieth).

In the "Evening World" of New York, of this date, I find the following, being a telegram from Jacksonville of even date: "The temperature for the past forty-eight hours has ranged 93 to 97 degrees, and thirty-four new cases of the fever were reported last night with four deaths. This swelled the number of cases to one hundred and sixty-four, and the number of deaths to twenty-three."

What will happen between this and frost I do not care to predict, further than to state that if the month of September continues as hot as the weather they are having, in that month the disease will show its greatest activity.

Let us suppose the present epidemic over. If it corresponds with epidemics that I have studied in Cuba, in Mexico, as well as on the Isthmus, during next year, 1889, there will be a few cases in the City of Jacksonville. I say a few cases, but if the people who are at present outside, flock back into that city, it goes without saying that the disease will be true to its traditions dating back four centuries, and will do its work. Such, generally, is the history of yellow fever following an epidemic, and the peculiar danger that I wish to refer to is this: That if the disease appears next year in Jacksonville, and appears early, it may spread to other southern centers and develop new epidemics. Time will flatly contradict this forecast or emphasize it. If the precautions are taken that science dictates under such circumstances, the disease may be kept in the State of Florida and not devastate the South. Let us bear in mind how the disease was encircled at Biloxi, and stamped out in the fall of 1886.

My travels during the past winter simply confirm my views as to the present tendency to epidemics. I may state that I have been on the Spanish main, in the United States of Colombia, and in Venezuela; thence to the Island of Trinidad, thence to Barbadoes, thence to St. Thomas, thence to Porto Rico, thence to Santa Domingo and Hayti, to Jamaica, and on to Cuba. In all the places named, the heat and seasons have been very irregular. On the Isthmus of Panama there was the usual smallpox and yellow fever. The heat in Venezuela was almost unbearable; it was likewise very hot in Trinidad; and in Barbadoes, just previous to my reaching the City of Bridgetown, two creoles by birth, one of whom had never been off that island, had died of yellow fever—simply another proof of my oft repeated statement, that the only protection against yellow fever is to have experienced it.

Ere coming on to this city (New York), I spent two months in the Island of Cuba—a greater part of the time in the old City of Santiago de Cuba, nearly three centuries old. The season on the island was very irregular—excessive heat, want of rain, parched hills and fields, scarcity of water, etc.; in short, the conditions that precede and accompany epidemics were there, and the island was and is full of yellow fever, together with a great deal of smallpox. It has been noted time and again that smallpox and yellow fever pursue their course at the same time; again, one follows the other. In other words, such atmospheric conditions favor any epidemic.

Many Cuban physicians call yellow fever in the children of creoles *boras*, naming it after the grumous vomit. I can only repeat here what I have stated in another paper in this work, that acclimation is an old time and worn out myth; nothing protects against yellow fever excepting having had the disease, and by not losing the protection that it gives by long residence in cold climates. I mean, that to enjoy the full protection given one after recovering from yellow fever, properly so called, he or she must keep within the yellow fever zone; and, apropos of this statement, I may add that I have yet to meet any student of yellow fever who has seen a secondary case, properly so called. That it is possible to have it again when the protection is exhausted, no doubt is true, as we had secondary cases of smallpox; but, unlike secondary cases of smallpox, I never have met a physician who could report a death; in fact, to repeat, I never have met a physician who has seen a true case of secondary yellow fever, and I have yet to read that a second attack, when it does occur, kills. Mind you, I mean yellow fever properly so called—*the disease with the usual symptoms and the invariable presence of albumen in the urine.* This statement explains itself to all students of yellow fever. In the localities where I became familiar with the disease, albumen is a *sine qua non*, and no case ever was diagnosed as yellow fever unless it was present combined with all the usual symptoms. I make this statement, as in many cases in the Southern United States, where there is a flushed face and twenty-four or thirty-eight hours, febrile movement, with a rapid pulse, without albumen, are called yellow fever. These, I believe, are the people who often claim they have had yellow fever twice. A crucial investigation of such cases will convince any tropical student of the disease, that such people did not have yellow fever as it is understood at Panama, Colon, Mazatlan, Porto Rico, or in the Island of Cuba. If they had had specific yellow fever, they never would have had it again.

We are in search of the truth, the only and real end of all inquiry, be it scientific or medical. Here I must draw this report to a close. If my readers feel disposed to find fault with any want of smoothness in this hastily written report, I crave their indulgence, and say, that the four reports sent forward to my friend Dr. Tyrrell have been dictated to a stenographer during four successive evenings, following long and busy days.

In conclusion, I wish to state that to rapid transit and want of the necessary quarantine regulations, both at Key West, Florida, and Tampa, Florida, both have suffered from yellow fever. At Tampa and Plant City the disease, as has been shown, hibernated during the past winter, and this year caused Tampa but little trouble, for reasons already given. It swept Plant City and now there have been many cases at Manatee.

Jacksonville owes her present epidemic to a man named McCormick, who forced his way into Plant City, returned to Tampa unobserved, got into a through sleeper that runs between Tampa and Jersey City, about August first, and went on to Jacksonville. The man was sick when he got into his section in that sleeper. His is the case already referred to, as having been found in the Grand Union Hotel.

The Jacksonville Board of Health, under Dr. Neal Mitchell, is making a magnificent fight, *but the disease has obtained a firm foothold, and despite the firing of cannon, prayers, or incense, it will go on.*

I do not wish my confreres to consider me a medical alarmist, but I want such of them as are interested in the welfare of their fellowmen, and who are earnest in their search for the exact truth, and the greatest good for the greatest number, to think carefully of what I have written, and perhaps they and others, combined with the press, may bring about measures that in the future will rob yellow jack of its terrors, and free the South from this terrible visitant that has cost her tens of thousands of lives and millions of damage.

If there is a disease known to the profession to-day that can be manacled, confined, or hemmed in by quarantine, it is yellow fever.

God grant that a time may be near at hand when those high in authority will recognize their great responsibility, and free this great republic from the reproach of yellow fever.

THE ISTHMUS OF PANAMA CONSIDERED AS A DISEASE PRODUCING AND DISTRIBUTING CENTER.

By Wolfred Nelson, C.M., M.D., member of the College of Physicians and Surgeons, Province of Quebec, Canada; late of State Board of Health, Panama, South America; Correspondent State Board of Health, California, etc.

In the ninth biennial report of the Board of Health of the State of California, in a lengthy article under the heading "Yellow Fever Considered in its Relation to the State of California," I dwelt upon the peculiar methods that had obtained in the Panama cemeteries in times past. I referred to the old time Colombian custom of unburying the dead year by year, and digging over the small cemetery at Panama. I emphasized the danger of liberating untold millions of germs of smallpox and yellow fever under tropical conditions, where they would naturally take on new and death-dealing powers, not only leading to local outbreaks, but, owing to the fact that Panama is the gate to the Pacific, that these criminal methods (for I can call them nothing else) endanger all trading with the Isthmus, either on its Pacific side or on its Atlantic seaboard.

During March and April of this year (1888), I visited my old hunting grounds, and had a thoroughly good look at everything on both sides of the Isthmus. On the Panama side I visited the cemetery, that was opened during the summer of 1884 with inaugural addresses and a band of music.

Colombians are eminently fond of giving concessions; thus one man has a concession for selling opium, another man has an exclusive concession for all the gambling hells on the isthmus, a third holds a concession for a lottery, and last, but not least, the *omnium gatherum*, Señor Don Nicanor Obarrio, holds a Government concession for the burial of the dead. This may seem an extraordinary statement to make in this enlightened age, but it is so. No burial can take place in the Panama cemeteries without paying a fee of $5 to Mr. Obarrio, he having the exclusive concession from the Federal Government of the United States of Colombia. This is a mere prefatory statement, but explains what will follow.

In July, 1884, the new cemetery, with its *bovedas* sections, was opened. The *bovedas* of the isthmus are those met with in the Spanish West Indies, in Spanish America, etc. They have been handed down from the time of the Spaniards. They are immense masses of masonry, built in tiers of openings or niches three stories high. By this I mean that you have a ground row of niches, each niche being a receptacle for a single coffin. Then there is a second row, and a third or topmost row, the whole built of masonry. Mr. Obarrio's concession naturally includes this, the ultra fashionable section of the Panama cemetery. Now to explain its *modus operandi*.

We will say that Fulano de Tal has been gathered to his fathers. Having dispensed with his medical friends, he is received by Mr. Obarrio and placed in one of these niches, the entrance to which may be closed either by brickwork or with a plain marble slab, with the usual inscriptions. Eighteen months' rent for this niche is paid in advance, a few, very few, becoming permanent settlers. At the end of the eighteen months, failing a renewal of the rent, Fulano de Tal is evicted, or, in other words, goes to to the bone heap. Back of the old section of *bovedas*, in the old cemetery, I once counted coffins, more or less intact, seven and twenty in number. It was a sight even to a medical man. I can perfectly recall to memory seeing in one what had been the form of a woman with a magnificent head of hair, the remains of high heeled boots, and the paraphernalia belonging to people of upper tendom. These literal outcasts of society had been evicted owing to the fact that their friends had neglected to pay another eighteen months' rent, and, as the Concessionaire had attended to business on business principles, their places were wanted. I need not dwell upon the great danger of this shameful style of procedure. I refer to the distribution of disease anew.

Having temporarily disposed of the *bovedas* sections, we will now briefly consider the ordinary burial ground. Mr. Obarrio, who is always equal to the emergency, has grave diggers constantly opening series of new graves in some instances, and disinterring the temporary tenants in others. I am dealing with this matter in all seriousness, and it is simply another illustration of the fact that the truth is stranger than fiction, and that the horrible sights to be witnessed in the Panama cemeteries, or back of them, seldom get into print. During that visit to Panama I went out to the cemetery one morning, and took my traveling camera with me. I wished to obtain a series of views of the absolute condition of things, because they were so extraordinary, that I could not even expect my old intimate friends to accept the extraordinary statements that will follow without them. The cemetery that was opened in 1884 had been filled when I revisited the isthmus in 1886, and a part of a large field back of it was partly filled with new made graves. Speaking from memory, the highest number that I noted in the field, back of the cemetery proper, was 3,884 (refer to April, 1886). The graves that we are now considering mark the temporary abiding place of the middle classes, hospital patients, and the poor of Panama. A simple black cross on the upper portion of its vertical section, the year is painted in white figures—for instance, 1886, on the transverse section, or arm, the number of the grave, let us say 3,884, this number corresponding with the number kept in the books of Mr. Obarrio. So much for this simple way of burial. It will be but correct to state that there are a few tombstones in the cemetery, a very few private lots, but they are for permanent settlers. When I was on the isthmus, in 1886, they had not commenced digging up the new cemetery—I mean eviction, *a la Colombie*—but when I got there this year I found that the new cemetery had been dug up entire; that all the numbers were doubled, and that upwards of one third of the field back of the old cemetery had been dug over.

Now, to try to make my meaning clear. I have before me a photograph, and in the foreground is a grave bearing the number "3,059" on the crosspiece, "1886" above it, and below the word "perpetual." This is an exception to the rule, and for this reason I cite it. Back of it, where I made my photograph, I saw nothing but a line of black crosses, with numbers expressed thus: "3,025," "3,024," etc. Let us consider 3,024. Above that we have 1886, and below, on the came cross, 1888, the meaning of which is this, that the tenant of 1886 had been evicted, and a new tenant was introduced in 1888. Thus the same cross can be used time and time again, and it goes without saying that the last date represents the last tenant, or 3,024 of 1888.

To talk about a business in second hand coffins seems a bold statement to make, and, one would fancy, an exceedingly difficult one to prove; but such is not the case, for back of the stone wall, in the cemetery proper, there was a row of coffins that had been taken out of those graves—for the most part common wooden coffins—placed there for sale. I do not enter into these details with a view of drawing a harrowing picture. I simply look at them from the standard of the sanitarian, and dwell upon them at length to point out this shameful and most criminal of practices of disinterring bodies by the thousands—not by the hundreds, by the thousands—having in view all the while that hundreds of these bodies, or the ashes that have been turned out under that tropical sun, amid all the receptive conditions that make disease an all-powerful agent—that hundreds of these were victims that died of yellow fever and smallpox. While a resident practitioner in Panama, together with the late Mr. John Stiven, we denounced the old cemetery, in the "Star and Herald," and the barbaric customs that had obtained for over half a century. Our denunciation was so pointed and strong, in the plainest of English and the most pointed of Spanish, that the Government stopped the vile practice, and for some years there was a little apparent decency and respect towards the dead. But, as will be gathered from the foregoing remarks, that period of respectability has passed over. Mr. Obarrio, the Concessionaire, found it easier to disinter the dead than to have his men break into the virgin soil in that vicinity. Not that it has any more value, for it has not, but it saved time and added immensely to his profits. As a direct result of the disinterring of the dead in the new cemetery, or what remained of them, the isthmus was visited by two epidemics of smallpox, and yellow fever is as much a part and parcel of the City of Panama and the City of Colon as it is a part of the City of Havana, already referred to in another paper. If the Colombians are satisfied to die, as the result of their own carelessness, so be it, but let them die without endangering others.

But for the fact that Panama and Colon are on the highway connecting two vast oceans, that tens of thousands of passengers and hundreds of thousands of tons of freight cross from ocean to ocean, and are distributed up and down the west coast of South America, the west coast of Central America, Mexico, and California, while much of it is shipped from San Francisco to Asiatic ports, and that Pacific cargoes passing from Panama to Colon are distributed all through the West Indian Islands, England, the Continent, and United States; but for this fact that the criminal practices now obtaining on the isthmus endanger each and all of these countries, we might be satisfied to allow the Colombians to die in their own way. No fact is better known to students of yellow fever—for there is a wealth of literature on the subject—than this: That yellow fever was taken to the Isthmus of Panama in the earliest times. It raged on the isthmus, it crossed it, and it was distributed up and down the west coast of South America, Central America, and Mexico. Yellow fever thus is permanently domiciled on the west coast of South America. It swept the western coast of Mexico as an epidemic, and dealt its commerce a blow from which it has not recovered; and, quite apart from that, it has established itself in endemic form.

All that precedes, I trust, will be sufficiently suggestive to thoughtful men, and this article is simply written for them and sanitarians, that they may grasp the indescribable dangers that the unburial of the dead on the isthmus causes. We can picture to ourselves the crossing of hundreds of thousands of packages, goods from Europe and from American ports crossing the isthmus to be handed over, on the one hand, to the steamers of the Pacific Navigation Company, plying south, to the steamers of the Pacific Mail Steamship Company, plying between Central America, Mexico, and California; and on the other hand we can see the hundreds of thousands of packages of coffee passing from Panama to Colon, to be distributed to ports in Europe, in the West Indies, and the United States. The man who has the courage to come forward and say that these things are not bearers of disease will be unwise in his generation, and show a lamentable ignorance in this advanced era of sanitary science.

Such is the exact condition of things on the Isthmus of Panama. It goes on, and it will go on, and the great outside world knows little of it, and no doubt hears less. Let us ask, on the other hand, what the isthmus has done in the shape of distributing disease. We have already shown that she has domiciled yellow fever on the west coast of Central America, Mexico, and South America. The late epidemic of smallpox that swept the Island of Jamaica came from the isthmus. There were upwards of eight hundred deaths in the Island of Jamaica. Next we have the disease appearing in the Island of Cuba, where, inside of twelve months, it had rolled up the fearful mortality of six thousand victims—I mean up to February, 1888. The old historic City of Santiago de Cuba, about ninety-four miles from Kingston, the capital of Jamaica, lost upwards of one thousand lives within a twelvemonth. It is thus that irresponsible Governments and conscienceless officials distribute pestilence and death in their headlong race for money and trade.

As I have stated in another article that appears in this report, we are indebted to commerce for much, and we are also indebted to it for the rapid distribution of disease, and for epidemic after epidemic. A word right here to those senseless writers who are constantly abusing quarantine measures and the other safeguards that common prudence and science have placed around nations, as well as cities. During the past winter I made two visits to the Island of St. Thomas, West Indies. All who are familiar with the history of the West Indies, and who may have read Trollop's "West Indies and Spanish Main," are aware of the fact that St. Thomas, in times past, was a by-word. She was swept by epidemic after epidemic. First cholera, next smallpox, next yellow fever. Her name was a by-word and reproach, and deservedly so. But what is her condition to-day? Denmark, the mother country, having noted the disrepute into which that island had fallen, adopted quarantine measures, and the result briefly stated is as follows: Owing to the vigilance of her quarantine officers there has been no yellow fever in that island for years, and not a trace of smallpox, and that despite epidemics all around her, and its past reputation of being one of the most insalubrious ports in the West Indies has gone. To-day that island is clean, healthful, and pleasant to visit, and I know of no point in the West Indies where strict quarantine measures have been attended with such perfect results. I make this statement *inter alia*, with a view of silencing writers who are opposed to quarantine, and who, in opposing measures adopted for the general good, are making themselves the creatures of those corporations that "have no souls to damn and no backs to kick;" and, in a measure, these men undoubtedly are responsible for the propagation of disease and death.

If there is one thing that is well known to even the merest tyro in yellow fever, it is the fact that never has a case appeared in any port, or on any ship, or in any quarter, but that the disease has been taken there by an infected individual, or by infected clothing, or by an infected vessel. And for those who wish to verify this point, I would recommend them to read the excellent article in "Ziemsen's Encyclopœdia," Vol. II, on yellow fever, and to refer them to the more recent and most excellent literature on the subject, published by a number of able French writers on yellow fever. They are the best authorities to-day.

Thanks to the kindness of my old and valued friend, Dr. Gerrard George

Tyrrell, Secretary of the State Board of Health of California, I am enabled to place my views before many readers. In common with him and many sanitarians, I am only anxious "for the greatest good for the greatest number," and hope by a persistent pointing out of this vile, indecent, and criminal practice, that the attention of Governments may be drawn to these irresponsible republics, and that they may be made to do what is right. In Europe, if a small State or country becomes "troublesome," the great powers say, "you must be quiet." Surely the time has arrived when nations, respecting their own rights and the lives of their own people, shall say to irresponsible republics like Colombia: "If you deal with us you must conform to the prescribed usages of civilization. You want our money for your goods; well and good, we will do business with you, but we will not accept the results of your criminal carelessness and introduce epidemics."

Now for a concluding paragraph, and it is one that I should like to have health authorities engrave on their mental tablets. It is this: It is customary with certain foreign Consuls at Colon and Panama to grant clean bills of health all the year round. I am happy to state that there are a few gentlemen speaking English on both sides of the isthmus, who have the courage of their opinions and cite the fact that yellow fever is there always, and if it were necessary to indorse their statements I shall here quote from a letter from Dr. Quijano Wallace, President of the Board of Health of the State of Panama. The letter that I refer to, was written on the thirteenth day of October, 1882, to Dr. Joseph Jones, then President of the Board of Health of the State of Louisiana. The paragraph translated into English, reads thus: "The actual sanitary condition of the ports of Panama and Colon is, generally speaking, good, as there does not prevail at present any of the usual epidemic diseases, it being a well known fact that smallpox, yellow fever, and the malarial fevers in their numerous varieties and forms, are never missing in these intertropical regions, where they are truly endemic."

If this paper is read in connection with that on Cuba as a disease producing and distributing center, it probably will throw additional light on this subject.

THE HOLT SYSTEM OF MARITIME SANITATION, OR AN IDEAL QUARANTINE.

By Wolfred Nelson, C.M., M.D., member College of Physicians and Surgeons, Province of Quebec, Canada; late of State Board of Health, Panama, South America; Correspondent State Board of Health, California, etc.

In August, 1886, during a visit to the Southern States, I, through the courtesy of Dr. Joseph Holt, the President of the Board of Health of the State of Louisiana, visited the quarantine station on the Mississippi. Thanks to the courtesy of Dr. Thomas Y. Aby and his assistant, Dr. Ryan, I had every facility given me for seeing the exact working of that most admirable system—a system built up and developed from point to point under the able guidance of Dr. Holt. It was my intention to have written a report on that quarantine system for the last issue of the biennial report of the Board of Health of the State of California; but, having stayed some time in the South during great heat and moisture, it resulted in a severe bilious, remittent fever, and instead of sending the report on for publication, I became intimately acquainted with a private ward in St. Luke's Hospital, Jacksonville.

Between that date and this, fire has destroyed the quarantine station as I knew it in 1866. Last year, on my return from Cuba, per steamship "Hutchinson," I, together with all of her passengers, went through the whole process. While the fire undoubtedly upset the plans of the Board for the time being, the result as a whole, I take the liberty of thinking, has been undoubtedly beneficial, as the building used to-day is a substantial one, made of brick, whereas the earlier edifice was built of wood.

I will now endeavor to give you a word picture of what happened to the steamship "Hutchinson" and her passengers upon reaching the upper quarantine. The passengers and their luggage were disembarked. They walked along the pier to the building referred to. One room was allotted to the women and another to the men. Their trunks were opened and their contents taken out and placed upon movable frames that ran into a steam-tight chest of huge proportions. All of the effects were arranged on supporting bars inside what I take the liberty of calling a steam chest, the various sections of which had checks fastened on them externally, and a check corresponding with that number was given to the individual whose effects were on a given series of shelves or supports constituting a vertical section within the steam chest. Such, briefly told, was the way in which our effects were taken and placed within that steam chest.

Now, to deal with what followed. Within that steam chest were steam coils without number, for dry steam and for moist steam. The temperature ran up immediately to 230, a point at which, as all students of bacteriology are aware, germs and spores are killed. Later the compartment was filled with moist steam; thus the effects were first baked at a temperature of 230; then they were saturated with live steam at a temperature of about 230, and were allowed to remain within the chamber upwards of half an hour. At the end of that time the long, sliding vertical sections were drawn out, and the individuals received their effects, piping hot, but wholly undamaged. It will be well to add, at this point, that the finest silks have been treated in this way without the slightest damage. While this process of killing germs, or any morbific particles, that might have become entangled in our effects while in Cuba, was going on, many of the coarser things, which could not be placed within the huge steam chamber, such as boots, shoes, rubber goods, etc., were thoroughly drenched with a solution of mercuric bichloride.

It will be but just to state that this excellent application of mercuric bichloride was first thought out and applied by Dr. Joseph Holt.

So much for the effects of the passengers and their luggage. Next let us get back to the steamer. While we had been absent a steam tug had been fastened to her starboard quarter, and a huge asbestos pipe had been adjusted to an opening in the main hatch. This pipe connected with a large furnace, in which sixteen pans were filled with burning brimstone. A current of air from without inwards was passing through the furnace, and the sulphurous acid gas thus generated was driven by a powerful steam pump through the asbestos pipe into the lower holds and all parts of the vessel. I may briefly cover this important section of the work by stating that it is most thorough and effective—so effective that all mice, rats, and cockroaches are killed. Time and again unfortunate cats that have been left on board have been killed. Thousands of feet of sulphurous acid gas are thus forced into all parts of the vessel under high pressure. The hatches are on, and the gas is confined for upward of two hours. All who are familiar with this most admirable of disinfectants and germicides know what a penetrating and all powerful agent it is.

I may state that vessels reaching the Mississippi, coffee-laden from Brazilian ports, have special shafts placed from the combing of the upper hatchway and extending to the floor of the lower hold, when such vessels reach the quarantine station. I saw one (the "Maranham") with a cargo of twenty thousand sacks, treated at the old quarantine station in the fall of 1886. Six hours was ample—a mere minimum of detention.

The decks and all parts of the ship are thoroughly washed with a solution of mercuric chloride, which the assistants spray over everything.

I have omitted to state that all the dirty linen from the ship, and everything of that nature, was taken on shore and thoroughly treated, so that it is simply impossible for any infected material to reach the City of New Orleans.

The mercuric solution used for the purpose of drenching the decks, disinfecting the bilges, etc., is kept in a huge tank at the end of the pier, a tank holding some ten thousand gallons. The steam tug has been fitted with all the necessary appliances—appliances that have been elaborated from point to point by necessity combined with experience. In the able hands of Dr. Holt and his assistant, they have evoluted the most perfect system of maritime sanitation known to science or the world. As Dr. Holt stands *in loco parentis* to this system, I have taken the liberty of dubbing it "The Holt System." His it is, and his should be the honor.

Such, briefly told, is the expeditious working at the upper quarantine. I do not enter into details as to the boiler-room, the steam boiler, specially constructed, or the methods by which the steam chamber is supplied with live steam, and with dry heat. These I do not deal with; I simply deal with the results.

The passengers are not allowed to leave the quarantine station.

Among the passengers with me on the steamship "Hutchinson," on that trip from Havana, was Dr. J. W. Ekens, a gentleman already alluded to in another article in this report. We were greatly pleased with all we saw, but thought we discovered a weak point, in that the clothing worn by the passengers themselves was not taken from them and disinfected, in the same manner as obtains in England when contagion or infection is likely to be carried about. Upon reaching New Orleans, and during a pleasant interview with Dr. Holt, we took the liberty of making this suggestion, when the system would be perfect in every detail. Dr. Holt received our suggestions in the frank and open way characteristic of that gentleman, and the day following he telegraphed the quarantine station that on and after that date all passengers should be supplied with a suit of their clothing that had been thoroughly disinfected, and that the suit that they had worn should be taken from them and put through the process of the steam chamber.

The exact beauty of the Holt system, briefly stated, is this: All germ life and spores are first and finally disposed of; secondly, cargoes are handled expeditiously at a minimum expense; thirdly, absolute protection is granted the City of New Orleans; and ship masters and passengers suffer but small delay, six hours to eighteen hours being ample for the purpose; and after the vessel clears from the upper quarantine for the Crescent City, she is sweet, safe, and healthy, and the State authorities know that vessels that have undergone this most crucial of treatments are not carriers of disease; they cannot be.

Now, to revert to some other phases of the quarantine system, as developed by Dr. Holt. On reaching the mouths of the Mississippi, the vessel is boarded by a medical man in the employ of the Board of Health. He makes a crucial inspection to see if there are any cases of infectious or contagious disease on board. If the vessel is clean, and there are no cases of disease, she receives permission to proceed to the upper quarantine, where all the steps already described follow. On the other hand, if there are cases of yellow fever or smallpox on board, she passes up the river a given distance and into an inlet, where the necessary steps are taken to disinfect her in the most thorough manner; her patients are placed in a small hospital, if necessary, and the vessel may be detained from four to six days, according to the requirements of the case, each and every case being treated on its own merits. If the passengers are disembarked, and the vessel has undergone the regular process of fumigation, disinfection, etc., she is allowed to proceed to the upper quarantine station, where each and all of the steps already described are enacted *de novo*—or, in other words, she undergoes double disinfection, fumigation, and cleaning.

With that best of knowledge, born of experience, Dr. Holt years ago refused to recognize even the so called clean bills of health from infected ports. I refer to the disease producing and distributing centers of Colon, on the Isthmus of Panama, and Vera Cruz, on the Atlantic coast of Mexico, and the various ports of Cuba. All of them are constant sources of danger to ports trading with them, particularly southern ports. Previous to 1884, when Dr. Joseph Holt was elected President of the Board of Health of the State of Louisiana, old-time methods obtained on the Mississippi, and owing to those old-time, unenlightened practices, commerce on the Mississippi during the summer was practically killed. The detentions were lengthy and the charges so heavy that commerce by way of the Mississippi during the summer, or fever months, was almost out of the question; but thanks to Dr. Holt's careful study, all that has been done away with. Trade by the Mississippi goes on in summer the same as in winter, it being practically unhampered. a result that could be obtained, and obtained only, by the most elaborate methods instituted by Dr. Holt. Unimportant branches of trade that hitherto were practically unconsidered, such as the banana trade, have taken on the handsome proportions of $1,000,000 per annum. For one consignment of coffee that was received under the old system, it will be safe to say that hundreds are received to-day; in short, that the old-time method of quarantine, which debarred Louisiana of her just maritime trade, is now of the past.

In concluding this brief and very hastily written article, it is but just to Dr. Holt to state that he is the father of this most admirable of methods of maritime sanitation, and that to-day in Central aad South America, in Mexico and the West Indies, all health authorities speak of the Holt system with admiration.

Quite recently, when in Port of Spain, Trinidad, one of the British West Indies, I learned from Dr. Leonard Crane, C.M.G., the Surgeon-General of the island, and Dr. C. Burgoyne Paisley, its ever vigilant health officer, that a system somewhat similar to the Holt system is about to be adopted there. I simply cite this to show how the good work done by Dr. Holt is bearing fruit, and how science, thanks to the conscientious and indefatigable workers of his type, is making constant strides.

In conclusion, it will be safe to say that, knowing what we do of germs, germ life, germicides, disinfectants, and the like, Dr. Holt has combined all of the best methods for destroying germs, and the result is "An Ideal Quarantine."

THE QUARANTINE METHODS OF LOUISIANA.

By Joseph Holt, M.D., President Board of Health.

In describing the methods of disinfection used in the quarantine of Louisiana, it is necessary first to examine the system itself synthetically.

There are three maritime approaches to New Orleans; the Mississippi, which is the central and main avenue; the Rigolets, thirty miles to the eastward, a narrow strait connecting Lake Pontchartrain with Lake Borgne, and the Gulf of Mexico; and the Atchafalaya River near its debouchment into the bay of that name, and Mexican Gulf, eighty-two miles to the westward.

On account of the character of shipping coming through the two lateral approaches, "light in tonnage, and mostly from domestic ports," the Rigolets and Atchafalaya are completely closed by a proclamation of forty days' detention against all vessels from quarantined ports, compelling such to seek the Mississippi as the only available route to New Orleans. This is done in order to avoid the immense expense of keeping up three completely equipped stations, and to concentrate at a single point the fight against infection.

The quarantine in the Mississippi is a system composed of three stations, the first of which is an advance guard inspection station, situated at Port Eads, one hundred and ten miles below New Orleans, where the waters of South Pass are jetted into the Gulf.

When an inward bound vessel comes into the offing, she is immediately boarded by a thoroughly skilled medical officer, and a careful inspection is made of her sanitary record and present condition.

If from a non-quarantined port, and all is well, she is given pratique, and goes on to the city. If from a quarantined port, but presenting a clean health record of voyage, and no evidence of sickness of a dangerous or doubtful character, she proceeds to the upper quarantine station, situated on the left bank of the river, seventy miles below the city, where she is subjected to a full course of sanitary treatment, and is detained such length of time, not exceeding five days (except in rare instances, where further observation may be deemed necessary), as the Board of Health may provide.

If, upon inspection, a vessel entering the river is found to be foul—that is, showing positive or suspicious evidence of infection, either in a person then ill, or in a foul health record of voyage—she is at once remanded to the lower station, located on Pass a L'Outre, an unused outlet of the Mississippi, one hundred and three miles below the city. The sick, if any, are at once removed to the hospital, where every provision has been made for them. The vessel, with the well on board, is dropped down stream a few hundred yards and anchored. In the meantime the quarantine tugboat, with its complete disinfecting outfit, has been telegraphed for and speedily arrives from the upper station, when the work of disinfection begins, and does not cease until the vessel has been subjected to the most vigorous application of solution of the bichloride of mercury; her atmosphere, below deck, completely replaced with one heavily charged with sulphurous oxide, and every article of baggage and ship's wardrobe has been saturated with the mercuric solution.

A ship known to be infested with one of the three great pestilential diseases—smallpox, cholera, or yellow fever—can stand and must endure extraordinary treatment, even if clothing is wetted and some articles damaged. "They who go down to the sea in ships" assume the perils of the voyage, among which is this occurrence of finding themselves on an infected vessel and being compelled to undergo a cleansing, for they have no right to bring their perils ashore and endanger others.

The immediate segregation of the sick and the well, and disinfection of the ship and all baggage (in the case of a cholera infected vessel extended to the disinfectant washing out and refilling of the water tanks, destruction of the food supply and revictualling the vessel) constitute the treatment of an infected vessel at this station. The ship, together with all on board, is held for observation a period of ten days, or more, according to circumstances, when she is released and proceeds to the Upper Station, where the processes of sanitary treatment are repeated, with the addition of the use of moist heat applied to baggage, ship's apparel, etc. (which latter process will be described hereafter), and the vessel is then allowed to proceed to the city.

This course of treatment at the Upper Station, while probably unnecessary, is enforced purely as an extraordinary precaution.

Inasmuch as infected ships are the exception, but inasmuch also as the Board of Health will take no risk in the case of vessels from known infected or suspected ports, regardless of bills of health, the vast majority of vessels are treated at the Upper Station.

Arriving at this station, the vessel is brought alongside the wharf. All on board—officers, crew, and passengers—are at once sent ashore, where they find ample accommodation in commodious shelter, provided for their entertainment during the time occupied in the sanitary treatment of the ship and all baggage.

As soon as this is completed they are permitted to return aboard ship, where they remain under observation during the prescribed period, determined by the remoteness or nearness of the port against which these precautions are taken.

The object of this brief detention for observation, after the sanitary treatment of the vessel has been completed, is to allow for a probable outbreak of an infectious disease already incubating in the system of any one on board.

As an essential part of the service there is a tugboat of sufficient power to move a sailing vessel to or from the wharf.

In addition to this requirement, this boat is equipped with a complete outfit for generating and applying germicidal gas for displacement of the entire atmosphere within the ship, transported, perhaps, directly from some infected port. In the hold of this tug is constructed a wooden tank of two thousand gallons capacity, to hold the bichloride of mercury solution for the treatment of vessels in the Lower Quarantine, as described. This tank is furnished with a steam pump (made of iron on account of the greater resistance of that metal to amalgamation) supplied with three-quarter-inch rubber hose. (See Plate 1.)

In the sanitary treatment of a vessel in quarantine, there are three processes of disinfection concurrently applied.

APPLICATION OF BICHLORIDE OF MERCURY.

The first is the wetting of all available surfaces of the vessel, excepting cargo, but including bilge, ballast, hold, saloons, forecastle, decks, etc., with a solution of the bichloride of mercury, made soluble by an equal weight of muriate of ammonia, in the proportion of one part to one thousand of water.

The idea of using this agent as a disinfectant in municipal and "maritime sanitation" suggested itself to me while reading the chapter on "Wound Disinfection-Antiseptics," in the volume entitled "The Treatment of Wounds," by Lewis S. Pilcher, M.D., containing an account of the experiments of Dr. George M. Sternberg, with a table of chemical agents and their relative germicidal strengths, at the head of which stands the bichloride of mercury, and also a table of the results obtained by Koch in Berlin, 1881, and by Schede and Kummel in the Hamburg General Hospital in the same year.

The Board of Health immediately indorsed the idea and ordered the adoption of the bichloride of mercury as explained in the following letter:

New Orleans, July 17, 1884.

Dr. Thomas Y. Aby, *Resident Physician, Mississippi Quarantine Station:*

Dear Sir: Because of the signal failure of carbolic acid as a disinfectant and prophylactic agent after a trial more fair and extended than has ever been allowed any other; because of its excessively offensive odor and oppressive and sometimes mischievous effects of its fumes; because of the low order of the commercial acid as a germicide, and the considerable expense involved in its use, you are hereby requested to discontinue its application.

In its stead I have ordered to your station two packages of bichloride of mercury and muriate of ammonia, the latter to act as a solvent.

In its preparation for use, take five and a half ounces of each, and dissolve in a half gallon of water; add this to forty gallons of water in a cask. I have sent three large watering pots, with a fine rose or spray. Your men can quickly wet down a ballast pile and all available surfaces of a ship, and it needs no repetition when once thoroughly applied.

The advantages of this agent are briefly these: The mercuric bichloride stands preëminently above all chemicals as a universal germicide. Not only are definite organisms immediately destroyed, but all protoplasms and albuminoids are devitalized by it. It is efficient to accomplish this work when applied in a solution so weak as not to be recognized except by chemical reagents. It is devoid of color or smell. It does not poison the air by vaporizing, but adheres in an innocuous form to the surfaces upon which originally applied. Its cost is about one eighth that of carbolic acid.

I feel that this transition is quite as much of a relief to you, my dear doctor, as to the afflicted people on shipboard, who must surely suffer severely from the stifling fumes emanating from carbolic acid applied to surfaces heated by a July sun, as the people of this city can testify to their terrible cost.

The position of persons confined on shipboard under such circumstances, particularly in the instance of women and children as passengers, as related by yourself, must at times be most distressing. The Board of Health heartily joins with you in the satisfaction and sense of relief afforded by this change, which is an important step in the great work of humanizing our quarantine.

I remain, with great esteem, yours very truly,

JOSEPH HOLT, M.D.,
President Board of Health, State of Louisiana.

The bold adoption of this poisonous agent in domestic, municipal, and maritime sanitation at once called forth a flood of most gloomy forebodings of fearful effects upon the human system.

Our declaration at that time is confirmed by an experience of four years' trial on an immense scale, that our standard solution, as used in sanitation, is absolutely harmless to persons unless swallowed, it matters not how extensive or constant the contact. The only objection we have yet discovered is that certain articles, particularly blankets and flannels, treated by the solution sometimes become spotted, and colors liable to "run" when wetted, suffer; but unlike all other chemical agents applied as disinfectants, the textile itself is in nowise injured.

Recapitulating its merits: being colorless, stainless (except as stated), odorless, not injurious to fabrics, perfectly safe to handle for months at a time, easily applied, and exceedingly cheap, it is impossible to imagine a substance more efficient and as free from objection in practice. It is, indeed, the key unlocking difficulties otherwise insurmountable, and rendering practicable in municipal and maritime sanitary work the efficient execution of scientific requirement.

The amalgamating powers of the mercuric salt presented many serious obstacles in the contrivance of an apparatus for its application, all of which have been overcome without sacrificing simplicity, efficiency, or economy.

Immediately adjoining the quarantine wharf and near its water edge, is constructed a heavy framework of piles, each twelve inches in diameter. This structure has an ample base, is pyramidal, and forty-five feet in height above mean level of the river. On top of this is a circular wrought iron tank, capable of holding eight thousand gallons of the mercuric solution. (See Plate 2.)

In order to prevent contact of the latter with the iron, the interior of the tank is painted over with three coats of red lead and two of paraffine paint. The top of the tank is closed by a secure cover, to prevent access of light to the solution. This, together with the general exterior, is painted black.

On the top of this cover is placed centrally a sixty-gallon wooden cask, in which is dissolved the mercuric salt, which is then emptied into the tank through a wooden faucet. Seventy pounds are used for one charge.

In the tank near the lower edge are three heavy galvanized iron faucets, to each of which is screwed a lead of three-quarter inch four-ply rubber hose, the farther ends of which lie on the wharf. These are lengthened by additional sections to reach any part of the largest vessel. To the far extremity of each hose is attached a short, wide nozzle, provided with a stop-cock.

During disinfection, all three are simultaneously used, fore, aft, and amidship.

For spraying, we use a perforated, heavy block-tin rose, four inches across the face, similar to an ordinary watering-pot spray. These are made with a shank about six inches long, to fit snugly into the open end of the pipe.

On a single vessel we average fifteen hundred gallons of solution, but often use three thousand.

The process requires from thirty minutes to two hours according to circumstances.

SULPHUROUS OXIDE FUMIGATION.

As soon as the men have completed the work of "bichloriding" below decks, the fumigating pipe is then extended from the quarantine tugboat lying alongside. (See Plates 1 and 2.) It is lengthened by sections, being fitted together like stovepipe, and conducted down a convenient hatchway to the bottom of the hold or as near the kelson as possible, preparatory to the fumigation of the entire vessel (and cargo if any) with sulphurous oxide. In the case of a sailing ship, one hatchway gives access of the sulphurous gas to the entire hold; but in large steamers the hold is subdivided by bulkheads into two or more distinct compartments, which must be treated separately.

In undergoing treatment, the cargo is not disturbed, except when the removal of bags of coffee is required, to permit the passage of the fumigating pipe, which is twelve inches in diameter, down into the dunnage at the bottom of the cargo.

I have given explicit instructions to coffee importers whereby the expense of removing bags to make this well, or shaft, through the cargo may be avoided. It is necessary to have an open framework shaft, allowing a clear inside space of fifteen inches, placed in the center of the main hatch in a sailing vessel, or in the center of each hatch in a steamship having bulkhead compartments. The framework of this shaft is set before loading, and should be cut flush with the top of the cargo.

This simple arrangement avoids all handling and delay.

When the connections are made and the fumigating pipe is arranged, the fan on the tugboat is started and the process of displacing, with sulphurous oxide, the entire atmosphere within the ship begins.

The length of time required to complete the fumigation varies from thirty minutes to three hours, according to size of vessel, number of compartments, etc.

The quantity of commercial roll sulphur used varies from one hundred to seven hundred pounds per vessel.

The apparatus invented for rapidly evolving and supplying the germicidal gas consists in a battery of eighteen furnaces, each supplied with a pan to contain the sulphur during combustion. These furnaces open into a common reservoir, to the further end of which is connected a powerful exhaust fan. (Sturtevant's No. 29.) (See Plates 3 and 4.)

The gas drawn by the fan is driven into a twelve-inch galvanized iron pipe, through which it is conducted over the side and down the hatchway of the vessel into the bottom of the hold.

The gas, as it is driven into the vessel, is quite hot, but would extinguish rather than create fire.

The outflow should not impinge directly against bags of coffee or bales of textiles, if it can be avoided, in order to prevent formation of sulphuric acid and some slight injury therefrom at that point.

In treating coffee, and for convenience in some other instances, the vertical lead of pipe into the hold is made of asbestos cloth, closely and heavily woven for our purpose.

Every opening is closely battened during the process and remains so for at least eight hours after it is discontinued.

The apparatus throughout is made ample in size and power for rapidity of work and economy in wear and tear, by lessening velocity and friction. The fan is run by a special engine at a slow rate as compared with its capacity, but driving into the ship one hundred and eighty thousand cubic feet per hour of atmosphere surcharged with sulphurous oxide.

APPLICATION OF DRY AND MOIST HEAT.

While these two processes of sanitary treatment of the vessel are going on, all bedding, ship's linen, cushions, mattresses, flags, mosquito nets, curtains, carpets, rugs, all personal baggage and wearing apparel of whatever description, are removed from the ship to a commodious building in close proximity (see Plate 5), in which these articles are treated by moist heat at a temperature of not less than 230 degrees F.

The apparatus for this work consists in a steel, forty-horse power steam boiler (see Plate 9), for supplying steam to a superheating chamber a few feet distant, and which I will now describe. (See Plates 6, 7, and 8.)

The dimensions of this chamber, taken interiorly or inside measure, are sixty feet long, eleven feet wide, and seven feet high.

The framework is composed of three by three inch seasoned pine lumber, joined as in the construction of a frame house. Upon the outside of this framework (and corresponding to weather-boarding in the case of a house) is nailed tongued and grooved flooring material three fourths of an inch thick by six inches wide.

The inside or interior of the ends, rear, and top of the chamber is ceiled with the same material and a flooring of the same is also laid. Upon these interior surfaces is tacked heavy "Russian haircloth or felting;" and upon this, at intervals of three feet, are nailed parallel strips of wood one and one half by two inches, and, in turn, upon these strips is fastened another sheathing or ceiling of flooring plank, as already described.

This secures an air space between the haircloth and inner ceiling. Upon this now smooth interior surface of wood is finally tacked and held in place by very broad-headed nails, or better, by nails supplied with tin discs or washers, a double layer of "asbetos building felt," well lapped and securely tacked; thus rendering the interior of the chamber fireproof.

By the foregoing described construction it will be seen that the walls of the chamber, which are eight inches in thickness, consist of seven non-conducting media; first, the outer layer of planking; second, three inches of air space; third, an inner ceiling of planking; fourth, one inch thickness of "Russian haircloth;" fifth, one and one half-inch air space; sixth, a third layer of three fourths inch planking; seventh, a double layer, or interior lining, of heavy asbestos felting.

The front wall is divided into forty panels, eighteen inches wide each (see Plate 6), which represents that number of racks contained within the chamber.

Upon the bars of these racks the clothing, etc., is hung for exposure to disinfection by moist heat. (See Plate 7.)

These racks are constructed with a front and rear panel united by horizontal bars, six to each side. Each rack is suspended overhead, on traveling rollers, upon an iron rod which extends from the rear wall of the chamber to a support ten feet in front of the chamber; the rod, therefore, being twenty feet in length.

By this arrangement overhead, the racks may be drawn out and pushed in with facility, thus avoiding tracks or rods on the floor obstructing the movements of employés.

When drawn out the full length of ten feet, the rear panels of the racks securely close the chamber, as do the front panels when the racks are pushed in; thus admitting of the heating of the chamber during the time of hanging the articles of clothing, etc., on the rack bars preparatory to disinfection.

For this admirable device and, indeed, for the entire skeleton of the superheating chamber, including the dry heat double steam coils, we are indebted to the Troy Laundry Machinery Company, Chicago, Illinois. We have found the purchase of this apparatus, constructed to include certain of our specifications, to be the most economical and satisfactory we could have desired.

The interior surface of each front panel is lined with a layer of Russian hair cloth, over which is applied a double layer of asbestos felting.

At intervals of seven and one half feet a bulkhead of one inch tongued and grooved flooring is constructed, subdividing the chamber into eight compartments. These bulkheads, or partitions, are made fireproof by a covering of a double layer of asbestos felting. The object of this arrangement is to provide against the spread of fire in the event of its occurrence.

In addition to this provision there is a double lead of one inch fire hose connected with a steam pump near the boiler, and at all times ready, within fifteen seconds notice, to turn on two streams of water upon any rack on which fire might have originated.

These minute specifications concerning provision against fire are particularly appreciated by ourselves; it cost us two fires and the destruction of a large amount of property to learn a lesson which experience alone could teach. Lacking experience and precedent, these accidents could not have been foreseen, and, therefore, could not have been provided against. They were the result of an underrating and failure to appreciate the prodigious force which the contrivance invented placed at our will to invoke.

Under the present arrangement, including early use of free steam, fire is hardly possible; but if it should occur we are prepared to draw out instantly the burning panel, to strip it of clothing, and to put out the fire.

With reasonable care and watchfulness on the part of the employés there need be absolutely no danger of loss by fire.

The superheating of this chamber is so provided as to furnish at will dry or moist heat, or both; and by a turn of the hand a temperature of 300 degrees F. can be obtained.

Within and at the end of this chamber next to and connected with the boiler are two manifolds, one above the other, to which is connected a system of forty-five three quarter-inch steam pipes (aggregating five thousand five hundred and nine lineal feet), placed horizontally near the floor of the chamber, running its full length, and supplied with a "bleeder" for conveying off the water of condensation.

This double coil furnishes the dry heat. (See Plate 8.)

Above and in close proximity to this system of pipes is extended a horizontal screen of galvanized iron one half-inch mesh, to catch and so prevent the coming in contact with the superheating pipes, any article falling from the racks. (See Plate 7.)

The moist heat is supplied by a one inch steam pipe laid centrally in the midst of the above described dry heat pipes and running the entire length of the chamber, constituting a steam main, connected with the boiler and controlled, as the others, by a ball-valve on the outside.

This pipe is perforated by eighty one twelfth-inch holes, so placed as to furnish steam to each rack.

During the time of hanging the articles of clothing, etc., on the racks, the dry heat is turned on and the temperature raised to about 190 degrees F., made known by a thermometer having a large mercurial column, and suspended near the center of the chamber, working on a slide or traveling rod in such a manner, when it is desired to make a reading, as to allow of being drawn forward (by a cord extending outside) to a long, narrow pane of glass set in the panel. This thermometer should have a scale of at least 275 degrees F.

As each rack is filled it is put back into place. By the time the last of the articles has been hung on the racks, the entire mass of the material within the chamber has attained a temperature between 190 degrees and 200 degrees F., when free steam is turned on, the thermometer speedily rises to a point varying between 230 degrees and 240 degrees F., at which it is maintained for a period of twenty minutes.

The steam pressure in the boiler, at the beginning of this process, registers between one hundred and one hundred and ten pounds by the steam gauge; at the end of the process of blowing in steam the pressure will have fallen to about sixty pounds.

The steam is now entirely cut off from the chamber, the racks are drawn out, and their contents removed.

During the process of steaming, every article is perceived to be saturated and intensely hot, the steam freely permeating to the interior of mattresses, double blankets, etc.; but so great is the heat in the texture of the fabrics as to immediately expel all moisture upon drawing the racks and exposure to the open air. Shirts, collars, etc., instantly assume the crisp dryness they possessed before exposure, losing the musty smell of long packing in a trunk. Silks, laces, the most delicate woolen goods show no signs of injury whatever from the treatment.

Of course, articles of leather, rubber, and whalebone would be injured by the heat and are therefore disinfected with the mercuric solution and not permitted to go into the heated chamber.

Time required to charge chamber with apparel for disinfection, thirty minutes; time required for moist heat, twenty minutes; for removal of articles, fifteen minutes; a total of sixty-five minutes.

A large steamship, particularly a passenger vessel, may require two or three charges of the chamber. Amount of coal consumed, from two to four barrels per vessel.

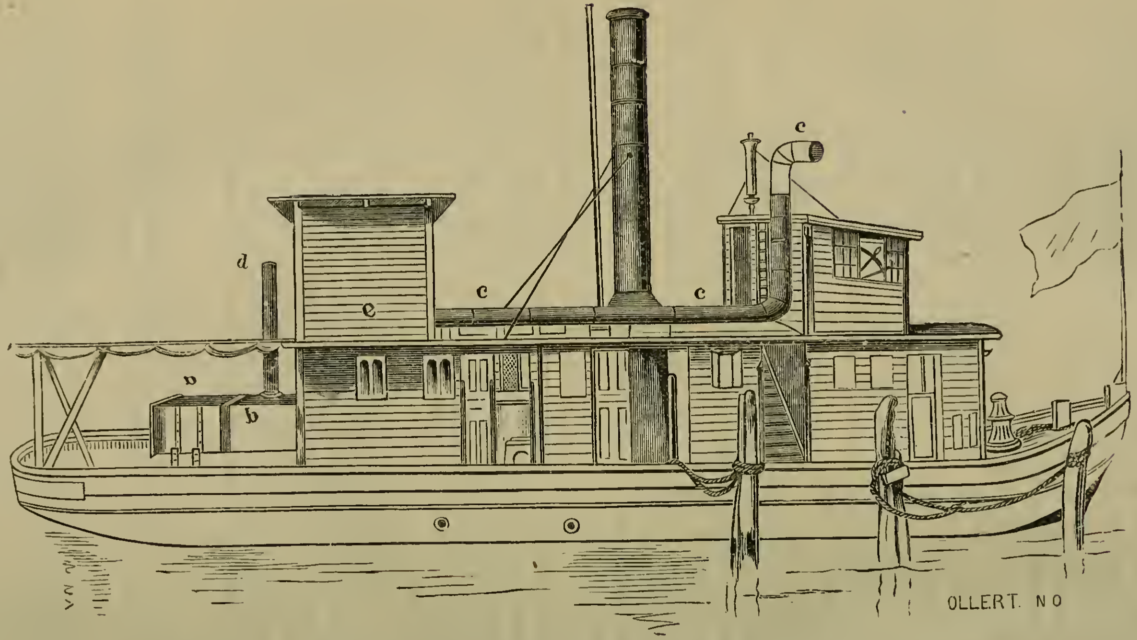
In the summer of 1885 we devised and put up a chamber of the above general plan, but wholly inadequate as to size for the requirements of our service. This was replaced by one operating on the same principle, but fifty feet long and supplied with a twenty-horse power boiler, which latter proved too small for rapid work. This apparatus was burned last spring.

Our present chamber and supply boiler are of the dimensions given in the appended plates.

We prepared the plans of the foregoing described apparatus during the summer of 1884. Obtaining a liberal appropriation of $30,000 from the State Legislature for the avowed purpose of establishing a new system of quarantine through the elaborations of purely experimental work, and thoroughly indorsed and sustained in all our efforts by the progressive spirit of the press of New Orleans and by the merchants, we put the new system into practical operation and threw open the Mississippi to commerce June 10, 1885.

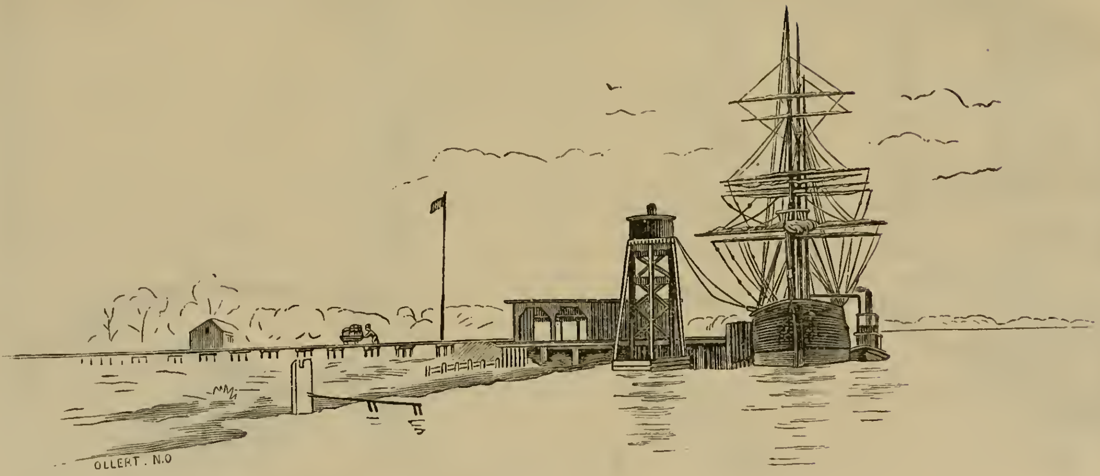
As it stands to-day (we sincerely believe in a nearly perfected state), it is the consummation of experimental effort, through a long and tedious process, beset with difficulties of the most perplexing and often disheartening kind.

Without precedent; having to deal with natural forces of prodigious power; repeatedly encountering unexpected difficulties; meeting with accidents; obliged continually to devise improvements upon our several inventions, and continually combatting a surly discontent and sometimes violent opposition from those subjected to the sanitary processes while these were still in an imperfect and unsatisfactory stage of development; the modernizing of quarantine and bringing it into line with other branches of science and art in the general progress, has been an expensive and difficult task.



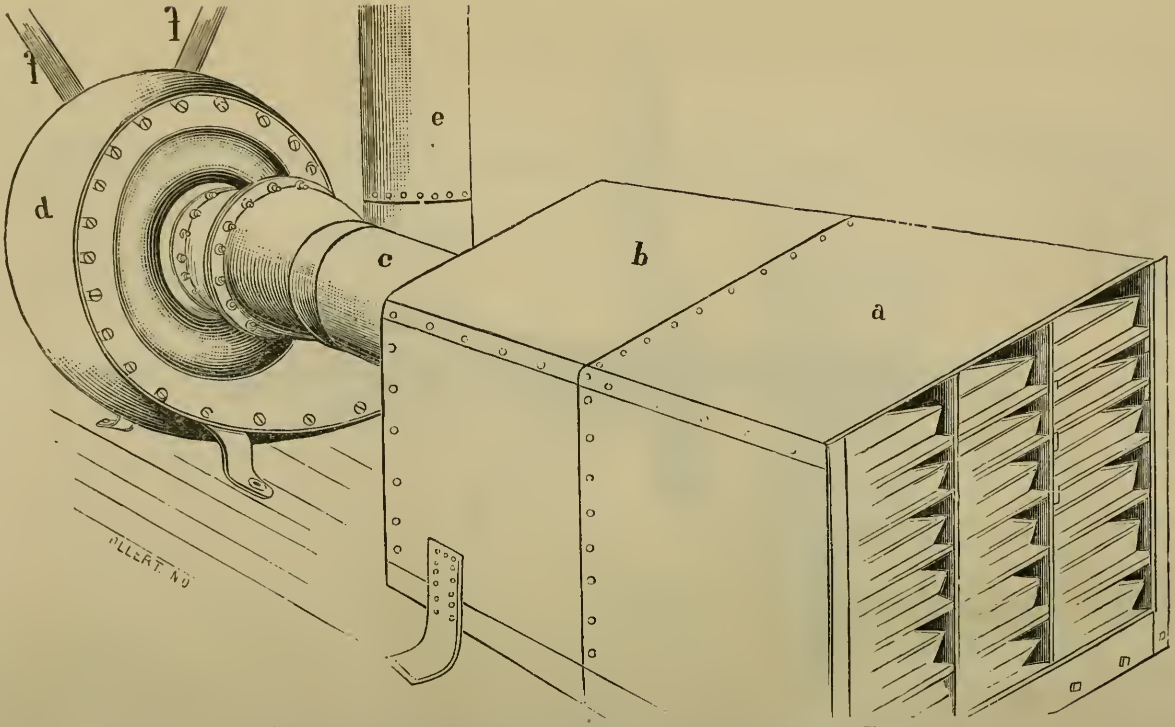
(PLATE 1.) TUGBOAT WITH FUMIGATING APPARATUS.

a. Furnace. *b.* Reservoir for reception of gas. *c.* Discharge pipe, conveying gas to ship's hold. *d.* Escape pipe for gas when fan is at rest and sulphur burning; closed by a valve when fan is in motion. *e.* House protecting from weather the machinery for driving fan and containing accelerating gearing.



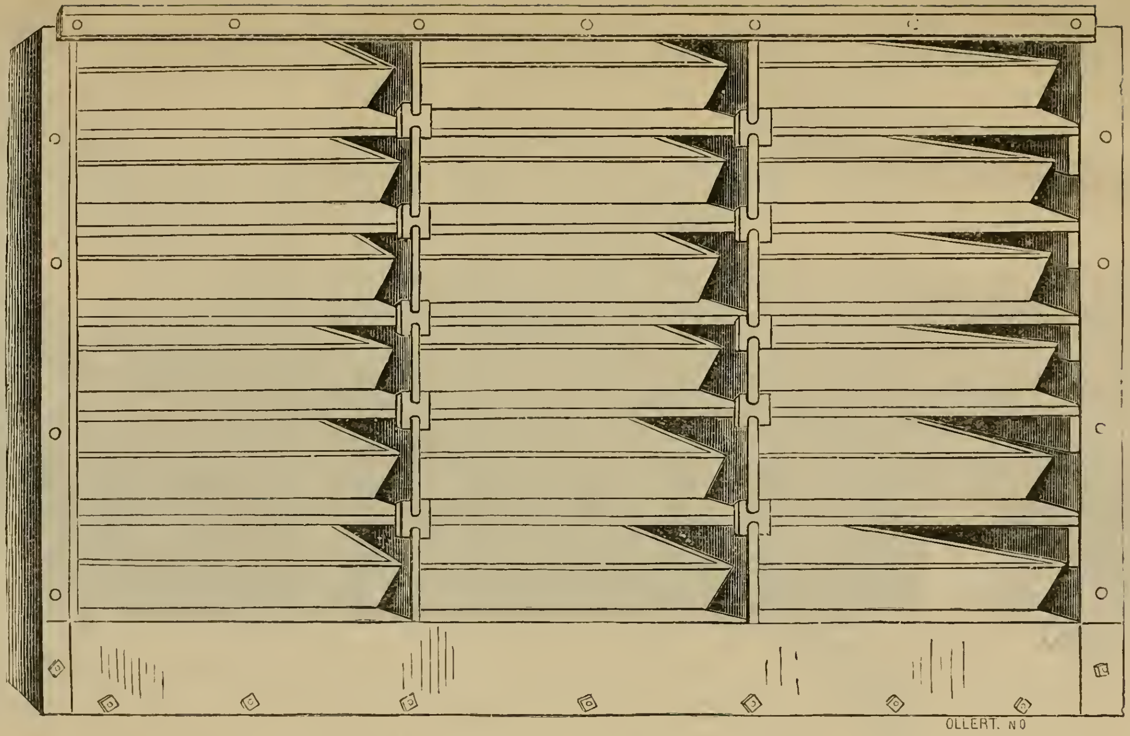
(PLATE 2.)

View of disinfecting wharf, showing tug fumigating vessel; elevated tank containing 8,000 gallons of bichloride of mercury solution, three leads of hose from tank to ship. Gangway leading to building containing superheating chamber.



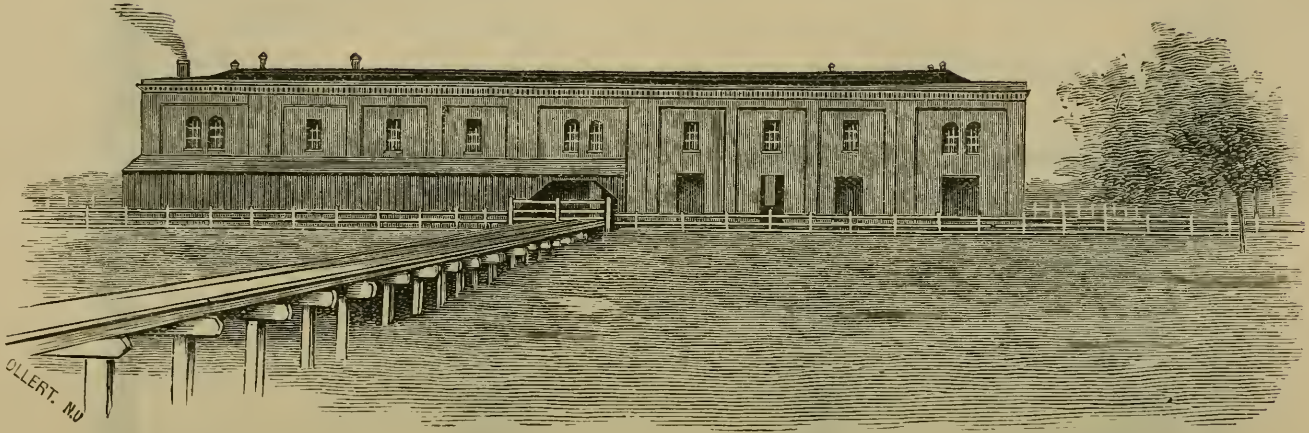
(Plate 3.) Fumigating Furnace, Reservoir, and Exhaust Fan.

a. Furnace of cast iron, ½ inch thick, 3 feet wide, 3 feet long, 2 feet high. Upper and lower plates grooved for reception of partitions, and sides shouldered for same, as shown in Plate 4. *b.* Reservoir, No. 10 iron, same dimensions as furnace. *c.* Exhaust pipe connecting reservoir and fan. *d.* Exhaust fan, Sturtevant's No. 29, Medium Planing Mill Exhauster. *e.* Discharge pipe from fan, made of No. 20 galvanized iron. *f.* Driving belt. Height of legs supporting furnace and reservoir, 10 inches. On reservoir, at letter (*b*), should be shown a 12-inch opening for escape pipe, as indicated (*d*) Plate 1.



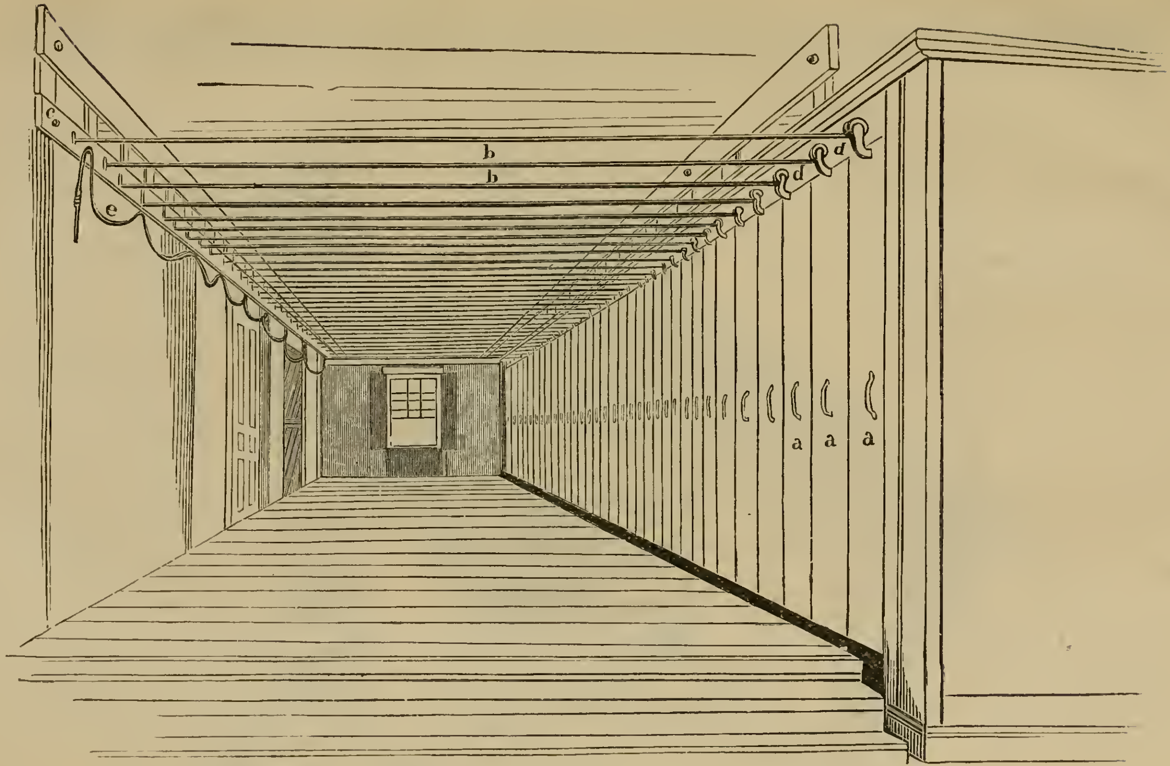
(PLATE 4.) FRONT VIEW OF FUMIGATING FURNACE.

Dimensions of each compartment, 12x3$\frac{1}{4}$ inches. Pans of cast iron $\frac{5}{16}$ inch thick, 11 inches wide, and 2 feet 10 inches long, outside measure. Free space above pan about 1$\frac{3}{4}$ inches.



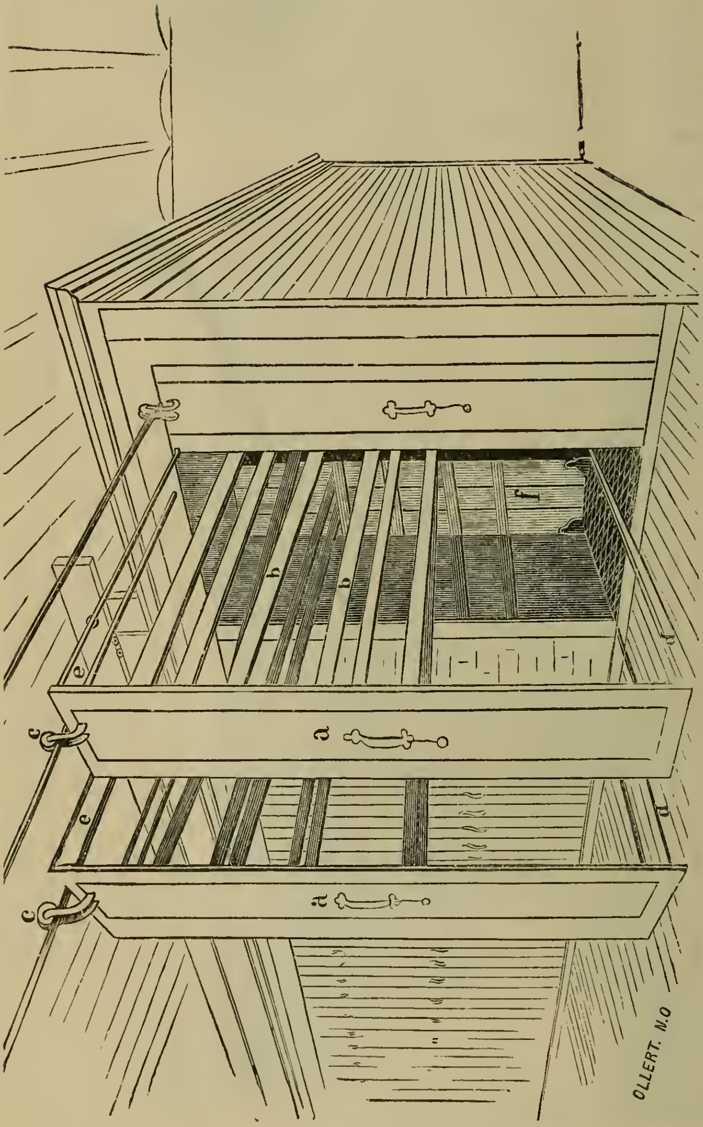
(PLATE 5.)

Brick building in which is located the superheating chamber; gangway in front connecting with disinfecting wharf.



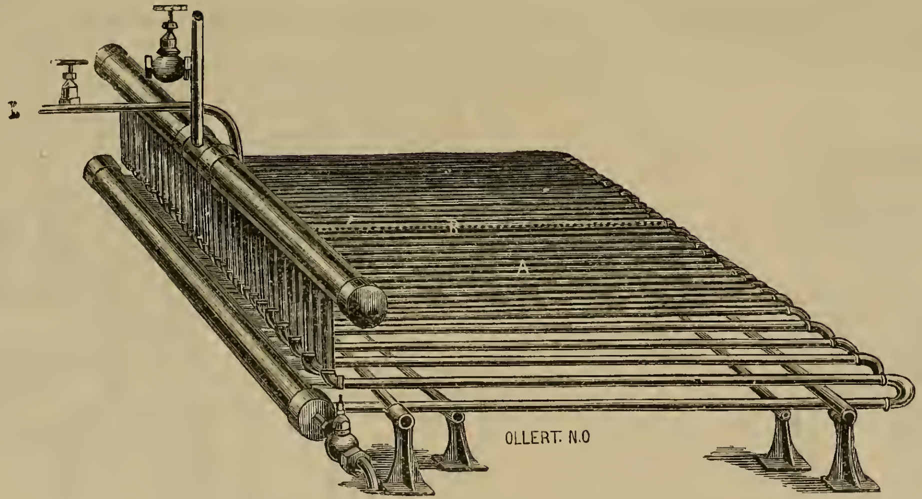
(Plate 6.) Front View of Closed Superheating Chamber (60 Feet Long).

a. Panels. *b.* Rods upon which panels are suspended and travel. *c.* Outer support of rods. *d.* Rollers suspending panels on rods. *e.* Fire hose.



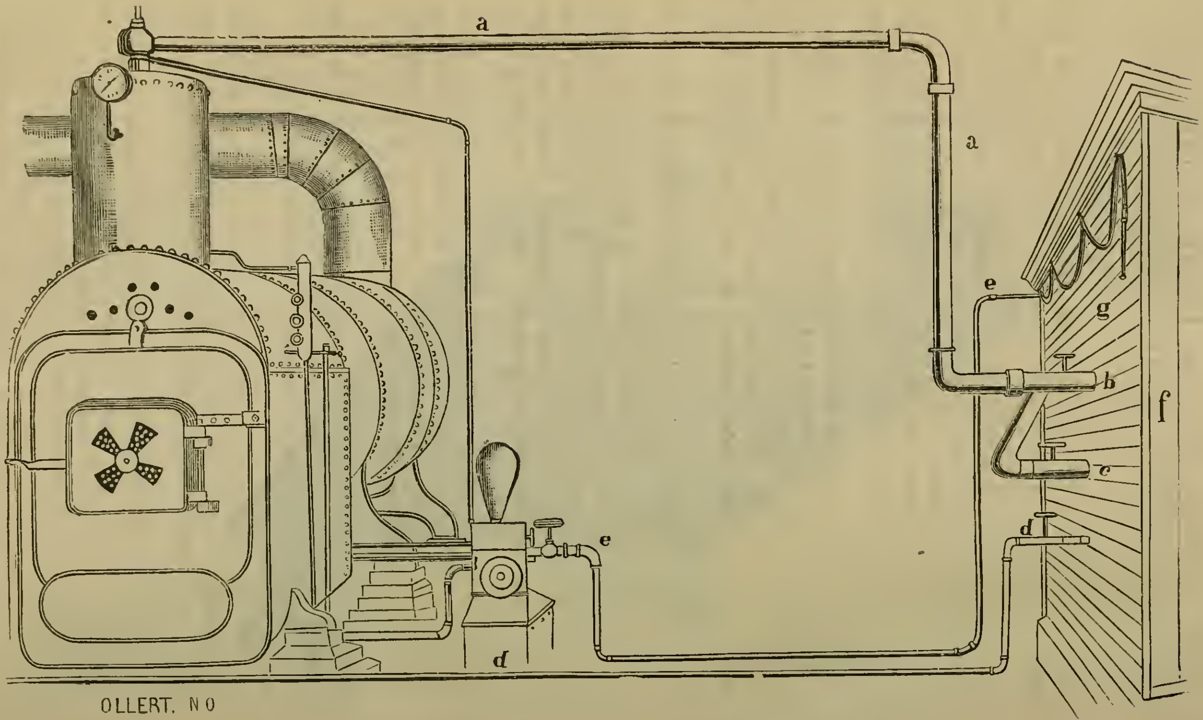
(PLATE 7.) SUPERHEATING CHAMBER, TWO PANELS DRAWN OPEN.

a. Panels. (Two lower rack bars not shown.) *b*. Rack bars. *c*. Rollers. *d*. Iron bars connecting front and rear panels. *e*. Rods upon which panels are suspended and travel. *f*. Rear panel. Galvanized iron $\frac{1}{2}$-inch mesh screen in bottom of chamber.



(Plate 8.)

Superheating steam coil for dry heat. *b-b.* Perforated steam pipe for moist heat.



(PLATE 9.) BOILER AND STEAM CONNECTION WITH SUPERHEATING CHAMBER.

a. Steam-main from boiler. *b.* Pipe supplying dry heat. *c.* Pipe supplying moist heat. *d.* Bleeder. *e.* Pipe from pump supplying fire hose. *f.* Front of chamber. *g.* End view of chamber.

REPORT OF H. S. ORME, M.D., DELEGATE TO THE FIFTH ANNUAL CONFERENCE OF STATE BOARDS OF HEALTH.*

The Conference, composed of one or more delegates from each State Board of Health, was held in Cincinnati, Ohio, May 4, 5, and 7, 1888.

The various questions discussed by the Conference had previously been formulated by the Boards of Health of the several States, and of the Provinces of Canada. These questions, with slight modifications, formed the programme or order of business of the Conference. Many subjects were discussed which vitally concern the Pacific Coast, so that it was very important for California to be represented. The following is a brief synopsis of the proceedings:

The President, Dr. McCormack, of Kentucky, opened with an address in which he urged the necessity of a better system of quarantine, and especially drew the attention of the Conference to the ever present danger of a visitation from Asiatic cholera. The exposed condition of the port of New York, and consequently of the whole country, he said, was chiefly due to political dissensions.

Upon motion of Dr. Thompson, of Kentucky, the matter of the President's address was referred to a special committee.

The question proposed by the Provincial Board of Ontario, "The duties of the Conference in urging the erection of isolation hospitals for treatment of infectious diseases (scarlatina, diphtheria, etc., as well as smallpox), as a more economical and effective method than placarding houses and quarantining familes where the diseases are present," was the first subject discussed.

Dr. Bryce, of Ontario, read a paper advocating the establishment of such hospitals. In London and in Glasgow there are hospitals for the treatment of typhus, and in New York there are typhus and smallpox hospitals. He advocated hospitals on the pavilion plan, or in groups of isolated cottages.

Dr. Probst stated that in Ohio local Boards had the authority to erect pesthouses and remove patients, but that authority was never exercised except in cases of pestilential diseases, such as smallpox. The families of the higher classes, moreover, would not consent to give up their children.

Dr. Thompson said that the government did not exist in any of the States that could carry out such a system. Where is the man who has the temerity to take a child out of bed, suffering with diphtheria three or four weeks, to one of the hospitals?

Dr. Baker, of Michigan, favored the establishment of such hospitals. "Diphtheria and scarlet fever are more important than smallpox. In our State we are aiming at removal of cases of diphtheria."

Dr. Lee, of Pennsylvania, considered the establishment of such hospitals was only a question of time. The people would soon regard them as a refuge and relief, rather than a means of tyrannical and cruel invasion of their rights. In Philadelphia, in cases of smallpox, the health authority had the power to remove the patient against the wishes of the family. The Courts have sustained this view both in Philadelphia and in Pittsburg.

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* Through an unforeseen accident this report was overlooked until it was too late to insert it in its proper place, after the Secretary's report; it was therefore thought proper to insert it here, with this explanation. (Ed.)

Dr. Thompson, of Kentucky, stated that in 1878 the matter was tested through the Courts of Florida and the Supreme Court, the Courts deciding that you had not the power to remove a patient. In Kentucky it was decided that you could isolate patients, but not remove them.

Dr. Hewitt, of Minnesota: "The rural population *do* want isolation hospitals. We have seen it time and again among our Scandinavian population that a cow house was used to isolate a sick child and its mother. Our people are learning the necessity of isolation, and, in cases of sickness, demanding it."

Dr. Orme, of California, said that in his State they had the power and authority to remove people from the hotels and boarding houses, but not from private homes. "In cases of smallpox, if we could go in and remove people, we could stamp out the disease right then and there. We have to placard and guard infected houses. This is the more necessary in my State because the native population, as a rule, are not afraid of smallpox."

Dr. Bryce closed the discussion, and the whole subject was then referred to a special committee.

The question proposed by the State Board of Health of Indiana was then called up: "Is it advisable to attempt to unify the method of procedure of the various State Boards of Health?"

After a brief discussion, Dr. Taylor, of Indiana, offered the following resolution:

Resolved, That a committee be appointed whose duty it shall be to examine the laws and methods of procedure governing the various State Boards of Health and those of the Provinces, and from them to construct a system of laws and procedure such as shall meet the approval of this body. Be it further

Resolved, That when such system or code is accepted by this body, every legitimate means be used to cause such to be enacted by the Legislatures of the several States.

The resolution was referred to the special committee, already existing on that subject, for consideration.

The questions, "Should the National Government assume the control of quarantine at all ports of entry?" (proposed by the State Board of Pennsylvania) and "Under which control should quarantine be, both in Canada and in the Union—under Federal Government (National), or under Provincial or State Governments (local)?" (proposed by the Provincial Board of Quebec), were discussed together.

Dr. Lee read an exhaustive paper, showing that, under the Constitution, Congress had the power to control maritime quarantine, and that it was only through the National Government that an efficient system for the protection of the whole country could be established. At the close of his paper he offered the following:

Resolved, That this Conference, recognizing the failure of the local authorities to administer quarantine effectually in a large number of cases, respectfully urges upon the National Government the duty of assuming control of quarantine at all ports of entry.

Dr. Hewitt said: "In the present emergency we cannot depend upon Congress. Even if obtained, an appropriation would not be available until July, and as the hot season approaches it behooves us to act promptly in some other direction."

Dr. Rauch, of Illinois: "The trouble with sanitation in this country is the difficulty of keeping politics out of legislation relating thereto. I am in favor of National quarantine, but I am opposed to the Marine Hospital Service having absolute control of it."

Dr. Baker, of Michigan: "I have no confidence in a National system of quarantine. We should not attempt to take away State control over this matter; the General Government should only aid the States in emergencies."

Dr. Orme, of California, said: "We should be friendly and try to act in concert with the Marine Hospital Service. They have done some good work. At the request of our State Board they placed inspectors in the Territory of Arizona, at Nogales and Yuma, to protect us from Mexico."

Dr. Thompson, of Kentucky, thought there were only two diseases with which the National Government ought to have anything to do—yellow fever and cholera.

Dr. Lee, in conclusion, was sorry that any members of the Conference should be influenced by prejudice.

The vote on the resolution was postponed, and Dr. Lee afterwards offered the following substitute, which was unanimously adopted:

Resolved, That this Conference heartily indorses the bill now before the Congress of the United States proposing to establish seven well equipped quarantine stations at certain points on the Atlantic and Pacific coasts, and urges that early action be taken upon the same; it also urges upon Congress the passage of the proposed Act to establish a National Bureau of Health.

The question, proposed by the State Board of Michigan, "What should be done to prevent the continued introduction of those dangerous communicable diseases, diphtheria and scarlet fever, which are common in this country, and which, therefore, cause the most deaths?" was next discussed.

Dr. Baker offered a resolution that these diseases be classed as pestilential and treated by quarantine.

Dr. Rauch, of Illinois: "The question is, who is to pay for this quarantine of foreign ships that bring in all sorts of disease? This is a question not alone of sanitary importance, but of national. It was only by a miracle that we escaped cholera last year. The New York authorities detained the "Alesia" only ten days, with six hundred and fourteen passengers from Palermo, a city in the cholera infected district. The more sanitary restrictions we throw upon immigrants the better for this country. Several epidemics of cholera have broken out in inland towns after the immigrants had unpacked their baggage—showing the want of proper disinfection at our ports of entry."

Dr. Thompson and Dr. Reeves thought that little could be effected by quarantine, Dr. Thompson maintaining that these diseases frequently originated *de novo*, without a preëxisting case.

Dr. Orme contended that cases of diphtheria and scarlatina should be isolated and quarantined against as carefully as smallpox or cholera.

Dr. McCormack considered this the most important matter before the Conference. More people have died in Kentucky in any one year from these diseases than had ever died from yellow fever and cholera.

Dr. Rauch held that there was no necessity for either of these diseases; quarantine would shut them both out.

Dr. Lee stated that there was a time when diphtheria and scarlatina were unknown in this country; they were introduced from abroad.

Dr. Hewitt was in favor of quarantining against them, if practicable. Of course, ships with these diseases on board should be quarantined, but between the different States it would be exceedingly difficult, if not impossible.

Dr. Reeves offered the following substitute for Dr. Baker's resolution:

Resolved, That in the judgment of this Conference the interest of public health will be conserved by emphasizing the fact that diphtheria and scarlet fever are diseases of such highly contagious and infectious character, that they should be dealt with by the most complete isolation of *all cases*, the most thorough disinfection of all infected articles and places, and by quarantining at the seaboard, and at all other places, with the same care that is taken with reference to smallpox or cholera.

Adopted.

Dr. Baker, of Michigan, offered the following, which was unanimously adopted:

WHEREAS, It is alleged that yellow fever is now present in Florida, a State not represented here because it has not a State Board of Health, and which is in daily communication with other States, and thus threatens all those of our States in which that disease can prevail; therefore,

Resolved, That all Boards of Health in States adjoining Florida are urged to immediately and continually exercise extreme care to keep the fever from entering their States;

Resolved, That in case it is proved that yellow fever is present in Florida, Boards of Health of adjoining States should establish and maintain a thorough system of so called inland quarantine, which means the inspection of travelers, the isolation of all infected persons and articles, and complete disinfection; these methods to be enforced with the least possible interference with travel and commerce, consistent with the protection of the public health.

The questions, "Powers which Provincial and State Boards should have over local Boards" (proposed by the Provincial Board of Quebec), and "What legal authority ought State Boards of Health to possess in the absence of local Boards?" (proposed by the State Board of Vermont), were then taken up.

On motion, Division (*a*) of the questions proposed by the State of California was included for discussion: "Cannot a plan be devised to insure uniformity and increase of power in State Boards of Health, by formulating in conference a draft of the extent of the increased powers desired in matters of quarantine, compulsory notification of contagious diseases, and other sanitary matters within each State, neglected or refused by local Boards, which formula may be expressed in a bill laid before each State Legislature for passage."

The discussion was opened by Dr. Orme, of California, who was of the opinion that a State Board should have complete authority. When the local organizations are in harmony with the State Board, then its duties would be chiefly advisory; but when a local organization, for any reason, refuses to act under the direction of the State Board, then the latter should compel it to act, or step in and do the work itself.

Dr. Hewitt said that in his State (Minnesota) the State and local Boards acted in harmony, the local organizations being under the control of the State Board. The control of infectious diseases of animals is in the hands of the State Board. Last year an epidemic of smallpox was suppressed in his State without the knowledge of the public press.

Dr. Baker held that the State Board should have no authority over local Boards. It should merely gather and distribute the facts.

The question proposed by the State Board of Michigan: "What is each State Board of Health doing to advance sanitary science—by the collection of statistics of deaths and their causes; by the collection of statistics of sickness; by the collection of statistics of meteorological conditions coincident with sickness and deaths?"

There was a lengthy discussion, participated in by all the members present, each delegate stating what had been done in his own State. It was the opinion of the majority of the delegates that there ought to be a law in every State of the Union requiring a certificate of death, giving the cause, and signed by some properly constituted officer, before the burial of any human body. The local health organizations should make regular reports to the State Boards; and, in addition, should report promptly every case of contagious disease. This would not only secure to us better protection against such diseases as smallpox, scarlatina, diphtheria, and cholera, but would furnish our State Boards with the necessary data from which full and correct tables of vital statistics could be compiled.

Dr. Allen, of Vermont, read a paper on the question: "What sanitary regulations are necessary in and about country residences?"

He called particular attention to the small and poorly ventilated sleeping apartments and to defective drainage, whereby kitchen slops and privies were allowed to contaminate springs and wells.

Dr. Lindsley, of Tennessee, gave, by request, an account of his extensive experience with cholera. He said that the only thing necessary to prevent the spread of cholera was thorough isolation and disinfection. If this international epidemic is to be stopped in its ravages, we must look to our legislators at Washington. Isolation and disinfection is the watchword, but it takes money to secure this end.

The following resolution was introduced by Dr. Hewitt, of Minnesota, and after a lengthy discussion, was unanimously adopted:

Resolved, That a committee of nine be elected by this Conference by ballot, to visit or correspond with the State, Provincial, and other authorities having charge of the seaboard to quarantine against dangerous infectious diseases, for the purpose of learning the methods there in use, and the character and amount of coöperation such authorities can and will give for the best protection of the people of this continent against said diseases, and that said committee be authorized to act for this Conference for this purpose and be instructed to report the results of their investigation to this Conference and to the State Boards of Health, and to arrange for such coöperation between the health authorities of this country should any such diseases threaten to invade or actually get a foothold on this continent. Such committee to have full power to fill vacancies.

The following were elected members of the committee: J. H. Rauch, Illinois; H. B. Baker, Michigan; C. M. Hewitt, Minnesota; J. N. McCormack, Kentucky; James Simpson, California; John D. Jones, Ohio; P. H. Bryce, Ontario; Benjamin Lee, Pennsylvania; T. G. Simmons, South Carolina.

The election of this committee was by far the most important work of the Conference.

At the next session of the Conference, Dr. Lee read a valuable paper on the question: "What should be the attitude of State Boards of Health toward leprosy?"

He cited many cases to show that leprosy was contagious and should be subjected to the strictest quarantine.

Dr. Orme, of California, said that this was a question which intimately concerned the Pacific Coast. He gave the history of several cases in California, occurring amongst the Chinese, and stated that the State had endeavored to adopt the most careful precautions with regard to the admission of lepers.

Dr. Lee offered the following resolution, adapted from that of a committee of the State Medical Society of California:

Resolved, That it is the sense of this Conference—

Firstly—That a strict quarantine should be established against leprosy, and that all lepers attempting to enter this country should be returned to whence they came;

Secondly—That those already here, or who develop the disease here, should be rigidly segregated;

Thirdly—That it is eminently desirable that entirely distinct hospitals should be provided for such cases; and,

Fourthly—That the bodies of deceased lepers should be cremated or buried in lime and their personal effects be destroyed by fire, after being treated with powerful disinfectants.

The subject being an entirely new one to the Conference, was, on motion, referred to a special committee, to report at the next meeting of the Conference.

Unfinished business being in order, the report of the committee appointed to draft a constitution and set of by-laws for the Conference (Dr. L. F. Salomon, of Louisiana; Dr. H. B. Baker, of Michigan; Dr. J. D. Plunkett, of Tennessee, Committee), was then called for.

Dr. Baker reported the following plan, which, on motion, was unanimously adopted:

CONSTITUTION OF CONFERENCE OF STATE BOARDS OF HEALTH.

The name of this association shall be "The National Conference of the State Boards of Health."

Membership.—The members of this Conference shall be the executive officers or the delegated representatives of the State Boards of Health of the United States, and of the Provincial Boards of Health of the Dominion of Canada.

Dues.—Each Board represented shall pay to the Treasurer of the Conference $5 per year.

Votes.—Whenever demanded by two delegates, any question shall be determined by a vote, each State being entitled to one vote.

Officers.—The officers of this Conference shall be a President, Secretary, and Treasurer. The duties of each officer shall be those which are usually performed by such officers, and collectively the officers shall be an executive committee to make suitable provision for meetings of the Conference, for programme, etc.

Parliamentary Rules.—Cushing's Manual shall be the guide to parliamentary action, in cases of question.

Amendment of this Constitution.—Notice of the nature of any proposed amendment of this constitution shall lie upon the table from one annual meeting to another before coming to a vote. Such notice having been given, this constitution may be amended at any regular meeting of the Conference, if the majority of States and Provinces represented vote in favor of such an amendment.

Dr. McCormack was reëlected President, and Dr. Probst elected Secretary, and Dr. Baker, Treasurer for the ensuing year.

The time and place for the next meeting was left to the Committee of Arrangements, and after an announcement by Dr. Lee that the Health Board of Pennsylvania would assume the expense of publishing the proceedings, the Conference adjourned *sine die.*

Immediately after the adjournment of the Conference, the Committee on Quarantine met and organized by the election of Dr. J. H. Rauch, as Chairman, and J. N. McCormack, as Secretary.

The Chairman was instructed to write to the State Board of Health of New York, reciting the line of action agreed upon by the Conference in regard to quarantine inspections and interstate coöperation, and make inquiry as to how far we might expect the assistance and coöperation of that Board. The Chairman was also instructed to correspond with the Surgeon-General of the Marine Hospital Service, in order to ascertain what protection the quarantine administered by his service is able to furnish to the country against contagious diseases.

On motion, it was agreed that four sub-committees be appointed; the first to report as to the efficiency of the quarantine stations from the St. Lawrence to Baltimore; the second, from Baltimore to Galveston; the third, the Pacific Coast; the fourth, to arrange for coöperation between the various State Boards:

Sub-committees.—1. From the St. Lawrence to Baltimore—Dr. Lee, Dr. Baker, Dr. Bryce, Dr. Hewitt. 2. Baltimore to Galveston—Dr. Simmons, Dr. McCormack, Dr. Jones. 3. Pacific Coast—Dr. Simpson, Dr. Rauch, Dr. McCormack; Dr. Orme to coöperate. 4. Coöperation between the States—Dr. Baker, Dr. Hewitt, Dr. Simmons.

On motion, the Chairman was authorized to formulate the questions to be answered or investigated by the different sub-committees.

In the Section on State Medicine of the American Medical Association, Dr. Baker, of Michigan, Chairman of the Section, delivered the annual address on "Recent Advances in State Medicine." He pointed out that a practical result of the work done by State Boards of Health in spreading knowledge among the people, was a decrease of mortality from preventable diseases.

The most important part of local, State, and National legislation on this subject related to the collection of facts. We should have statistics of sickness as well as of mortality, and much could be learned from a comparison of such figures with the records of temperature changes and atmospheric conditions.

Dr. Benjamin Lee read a paper entitled "Should not the National Government Defend Our Ports Against the National Enemy—Contagious Disease?"

He showed that, according to the Constitution, Congress had authority to assume control of maritime quarantine for the general welfare of the country.

During the past twenty years the assaults of foreign contagion have cost us more lives than were sacrificed in the great war immediately preceding that period; yet most of these lives might have been saved by the expenditure of a comparatively insignificant sum.

When quarantine was regulated by the local authorities, owing to the great expense all stations could not be of equal efficiency; but the weakness of one was a source of danger to the whole country.

In conclusion, he offered the following resolution, which was adopted:

> *Resolved*, That the Section on State Medicine respectfully suggests to the American Medical Association the importance of formally urging upon the National Congress the duty of at once assuming entire control of the maritime quarantine, and of taking immediate measures to make such quarantine effective before the advent of hot weather.

At another meeting of the section, Dr. Lindsley, of Tennessee, read a very valuable and interesting paper urging the enactment of laws requiring the "Cremation of Garbage."

At a general session of the American Medical Association, Dr. Walcott, Chairman of the Massachusetts Board of Health, delivered the annual address on State Medicine. From the vital statistics of Massachusetts, he showed that since the establishment of the State Board of Health in 1869, the percentage of deaths from zymotic diseases had decreased from 25.6 to 19. The most marked reduction was in the case of smallpox, which is a disease absolutely preventable by vaccination and revaccination. To take an individual case: Since the establishment of a Municipal Board of Health in the City of Somerville, the death rate from all causes had decreased from 22.86 to 16.68 per one thousand.

Under the conditions of civilized life the individual is perfectly helpless to secure the physical basis of health. There is no help but in coöperation on the most extended scale possible—individual, municipal, State, and National. The individual must be compelled to give up the liberty to injure his neighbor; the city must be restrained from converting into a sewer the river which supplies water to the villages on its banks below; no State should permit its own causes of disease, whether persons or things, to be transported into another State; and lastly, the General Government should take cognizance of those causes of disease which can be controlled by no other power.

In conclusion, he urged the proper organization of some central health authority, whether in the form of a Bureau of Health, or a Board of Health, provided only that some of the great resources of the nation might be applied to the protection of that most valuable of all property, *human life.*

A resolution was adopted by the Association, urging upon Congress the necessity of the immediate passage of Senate Bill No. 2493—"To Perfect the Quarantine Service of the United States."

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